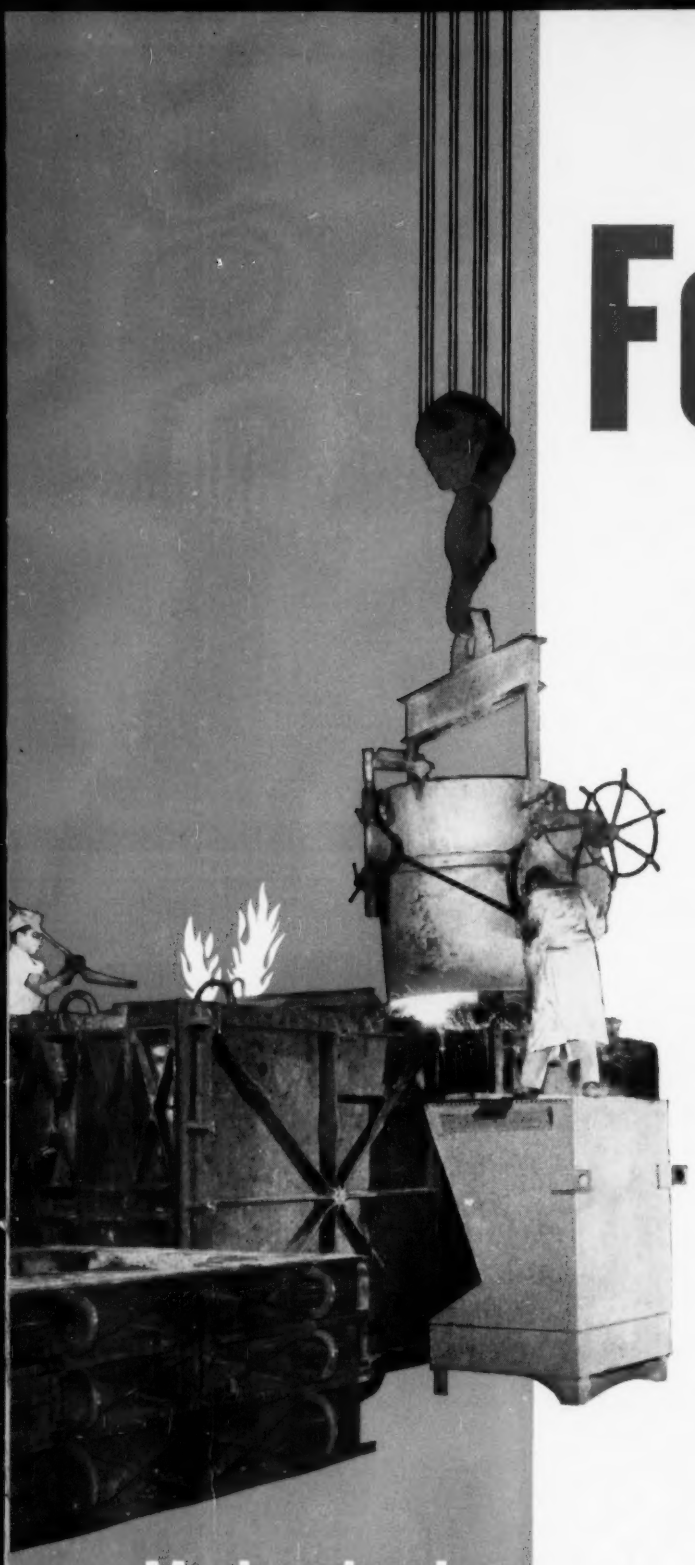
JUNE 1959

FOUNDRY

A PENTON PUBLICATION



Modernized Steel Foundry

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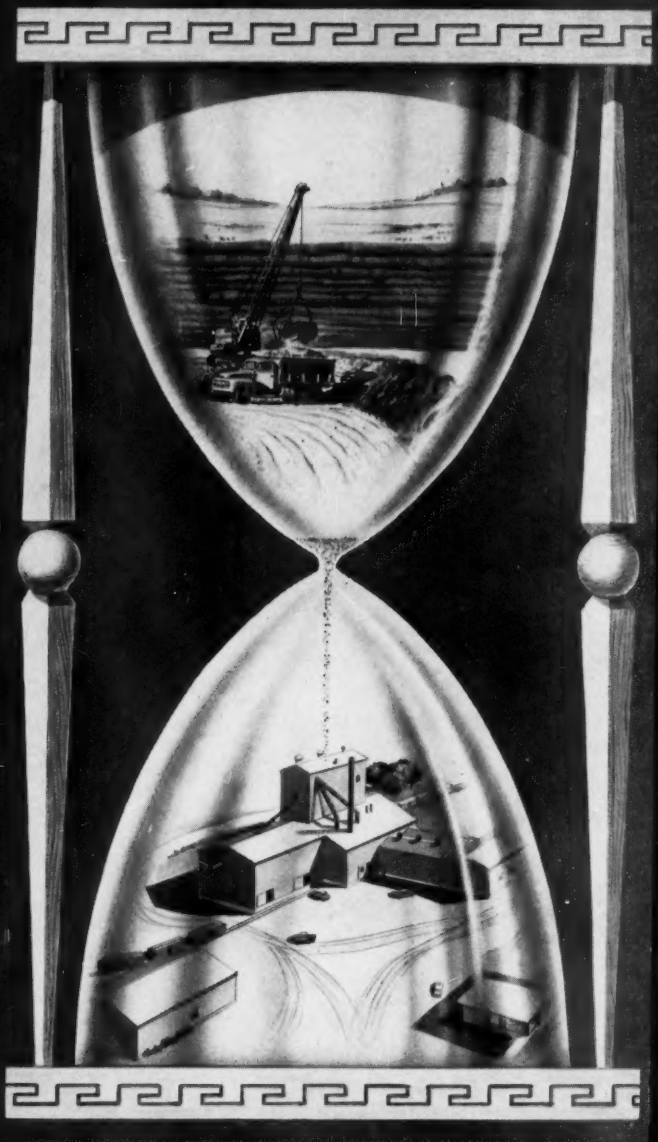
TIME WILL TELL...



SUPPLY...

should have an important bearing on any foundry's decision to standardize with one bentonite brand. Any abrupt change in the clay's characteristics due to depletion of the supplier's original reserves can needlessly disrupt casting operations in the future.

More than 200,000 tons of the finest collodial bentonite, YELLOWSTONE, are stockpiled at Magcobar's Greybull, Wyoming, facilities, along with more than 20,000,000 tons of the purest known western bentonite ore in reserve. The world's largest mine — the world's largest reserves!

DEMAND...

for Magcobar's YELLOWSTONE continues to increase as more and more progressive foundries discover that up to ten percent less of this pure, uniform clay is required. Uniform green strength, tensile strength and permeability are controlled at the plant to assure consistent specifications.

The next time you order bentonite, demand YELLOWSTONE Bentonite — your guarantee of dependable supply and uniform quality. Write for technical bulletins numbers 1 and 2 entitled "Bentonite Evaluation" and "Bentonite and the Muller."

YELLOWSTONE
BENTONITE

"OLD FAITHFUL"

MAGNET COVE BARIUM CORPORATION

Des Plaines, Illinois, 576 Northwest Highway
Houston, Texas, P. O. Box 6504
Greybull, Wyoming

Checking Regulus I surface-to-surface missile prior to launching from experimental cart. For the use of Ni-Cr-Mo steel castings in the launching cart, Chance Vought was judged a National Award Winner in the Third Product Development Contest conducted by the Steel Founders' Society of America.

How castings of 4330 nickel-alloyed steel help boost a missile up, push assembly cost down

20-Ni-Cr-Mo steel castings replace 73 detail parts, eliminate 300 hardware items in new launching cart

Regulus I, made by Chance Vought, is normally boosted skyward from a rail launcher. The Navy, however, wanted a more economical launching technique that would utilize a carrier's powerful catapults . . . that would also simplify handling of the missile aboard ship.

The answer was the expendable catapult cart you see above.

The carts, also made by Chance Vought, are assembled with 20 cast 4330 steel cluster joints welded to tubing of the same material. These castings replaced 73 detail parts required in the plate-type fittings of the experimental units used to prove the idea. They also eliminated 300 hardware items, such as nuts and bolts. Assembly is easier, and far more economical.

Why Ni-Cr-Mo steel for the castings? The 4330 composition of 1.8% Ni .65% Cr. .25% Mo heat treated to 125,000 and 150,000 psi gives these castings the combination of high strength and great toughness needed to stand up to the tremendous shock of take off.

What about your product? Can it use the economy, high strength, and shock resistance offered by Ni-Cr-Mo steel castings? You can get complete information by writing:

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67 Wall Street INCO New York 5, N. Y.

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NICKEL MAKES ALLOYS PERFORM BETTER LONGER

No cleaning job too tough for Wheelabrator®

This mammoth casting, for example. Cleaning with manual methods required days of labor. But Wheelabrator airless abrasive blast cleaning reduced the job to minutes besides improving cleaning quality and effecting impressive savings in overall cleaning costs. Wheelabrator has no peer in the number and range of cleaning problems solved nor in the ingenuity with which equipment has been designed and engineered. Here you have at your disposal the richest background of practical cost-saving ideas in the blast cleaning industry.

Write for our 40-page manual of special cleaning problems solved by Wheelabrator cabinets. Ask for Catalog 105-D.

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CORPORATION

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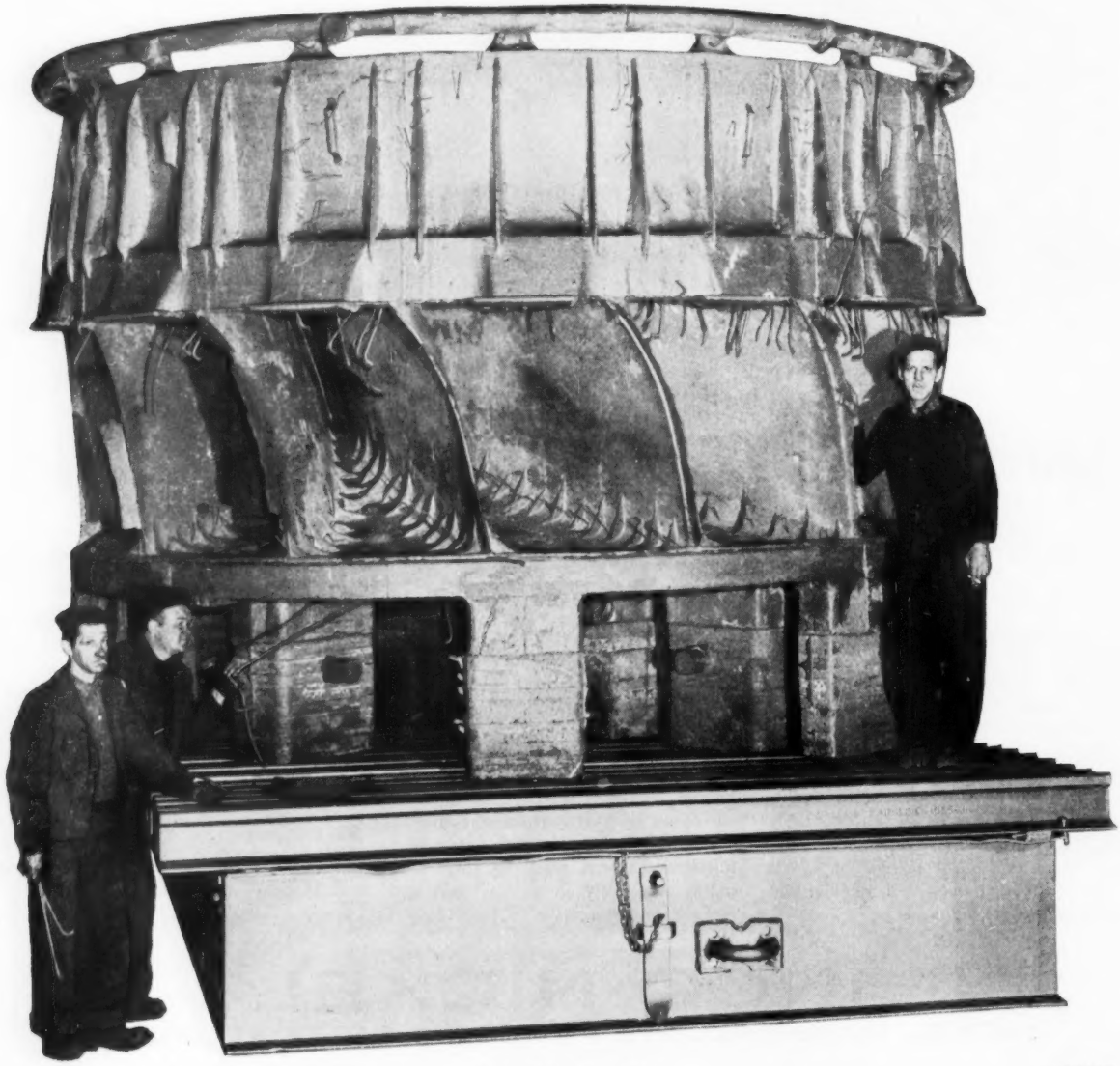
Canadian Div. Box 490, Scarborough, Ont.

World's largest manufacturers of airless blast equipment and steel abrasives.



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One of the most interesting of foundry operations is the tapping of a large electric furnace. This dramatic photo was taken at the LFM Mfg. Co., Atchison, Kans. An article on its expanded and modernized foundry starts on p. 72

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FOUNDRY
A PENTON PUBLICATION

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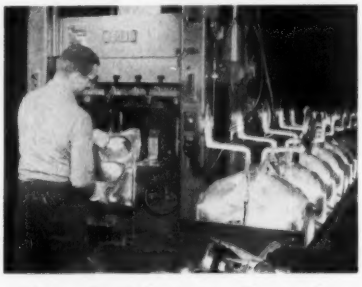
THE EDITORS' WORKSHOP

FAST MOVE: It took Chrysler Corp. only about two months to equip and put into operation its large aluminum diecasting plant at Kokomo, Ind. The story will be



told in the July issue. Shown here are automotive torque converter housings being conveyed to a hydraulic press for trimming.

CHANGING TIMES: The titles of articles listed on the cover of this issue would have sounded strange to the average foundryman not many years ago. Titanium, Epoxy Coreboxes, Ceramic Molds, and Radioisotopes are typical of the many postwar industrial developments which have found application in castings production. Times have changed—and changes will continue.

GETS ABOUT: Last year Prof. C. C. Sigerfoos of Michigan State University served the International Cooperation Administration as foundry

consultant in Latin America. Currently he is doing a similar job for ICA in Yugoslavia. He is shown here, right, with Bozidar D. Djordjevic, interpreter, and Mrs. Lulo Branislava, metallurgical engineer, in the laboratory of the Ivo-Lola Ribar enterprise at Zeleznik, near Belgrade, Yugoslavia.

Report from Jim Coleman,
41-year veteran
Core Superintendent,
Wellman Bronze & Aluminum
Company, Cleveland, Ohio

"We scrapped 10 TONS of MISTAKES!"

"... our customer wasn't pleased. We were exceeding dimensional tolerances on a large magnesium casting. The trouble was core sag. ADM offered to work with us on the problem. We made a 1200 lb. trial mix* using **ADMIREZ UP-15.** Core sag stopped—accuracy and finish improved—our customer is happy again. As a result we actually threw out twenty 960 lb. "borderline" core sets made with the previous binder. We followed up with a more extensive test and found some bonus benefits—faster baking, higher collapsibility and less stickiness. The men say there's a lot less smoke and objectionable odor, too. We tried **ADMIREZ UP-15** ... we saw it work ... we bought **ADMIREZ UP-15** ... it's that simple. We've had excellent results with **ADCOSIL**** too."

*Formulas on request

**ADM's CO_2 Binder

Write for more information on the full line of **ADMIREZ** products manufactured by—

Archer QUALITY

Archer-Daniels-Midland company

FEDERAL FOUNDRY SUPPLY DIVISION

2191 West 110th Street • Cleveland 2, Ohio

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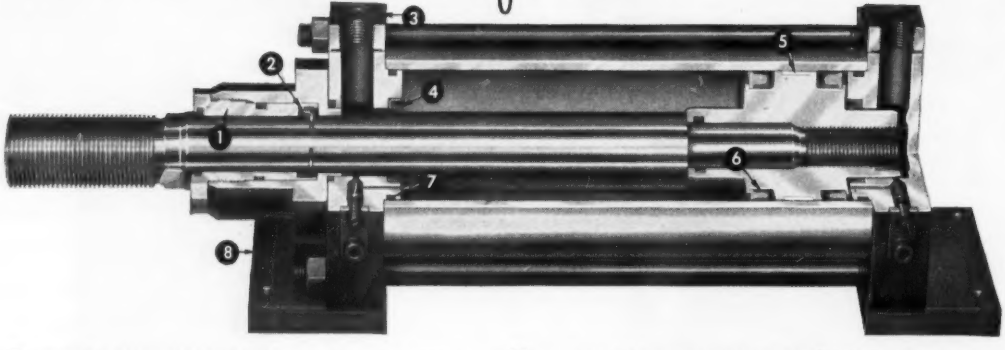
Announcing Valvair®

Check these Valvair features...



1. **EXTRA-LONG NOSE GUIDE** provides maximum bearing area for piston rod . . . assures peak resistance to side-loading deflection of rod and piston.
2. **CARTRIDGE SEAL** assembly is designed for quick on-the-machine servicing . . . can be replaced without any disassembly of the cylinder.
3. **REMOVABLE PORT ADAPTERS** allow fast exchange of complete cylinder assemblies for bench servicing . . . time consuming piping operations are eliminated.
4. **SELF-ALIGNING CUSHION SEALS** assure uniform cushioning throughout cylinder life . . . unique one-way seal eliminates need for cushion ball check.
5. **TEFLON* WEAR STRIP** on piston prevents metal-to-metal contact between piston and bore . . . scuffing or scoring of bore surface cannot occur.
6. **NYLON-BACKED PISTON CUPS** for air service, or Teflon-backed O-rings for hydraulic applications, provide positive, bubble-tight sealing throughout the cylinder's operating pressure range . . . keeps break-loose pressures low.
7. **POSITIVE BARREL SEAL,** with full-width metal-to-metal contact between barrel and heads maintains leak-free sealing . . . holds dimensional stability under maximum stress.
8. **RE-USABLE MOUNTS,** with precision-fit load bearing slots, handle heaviest operating loads with ample safety factor . . . are easily changed for modification or re-use of cylinder.

**Trade name for duPont tetrafluoroethylene resin*

8029

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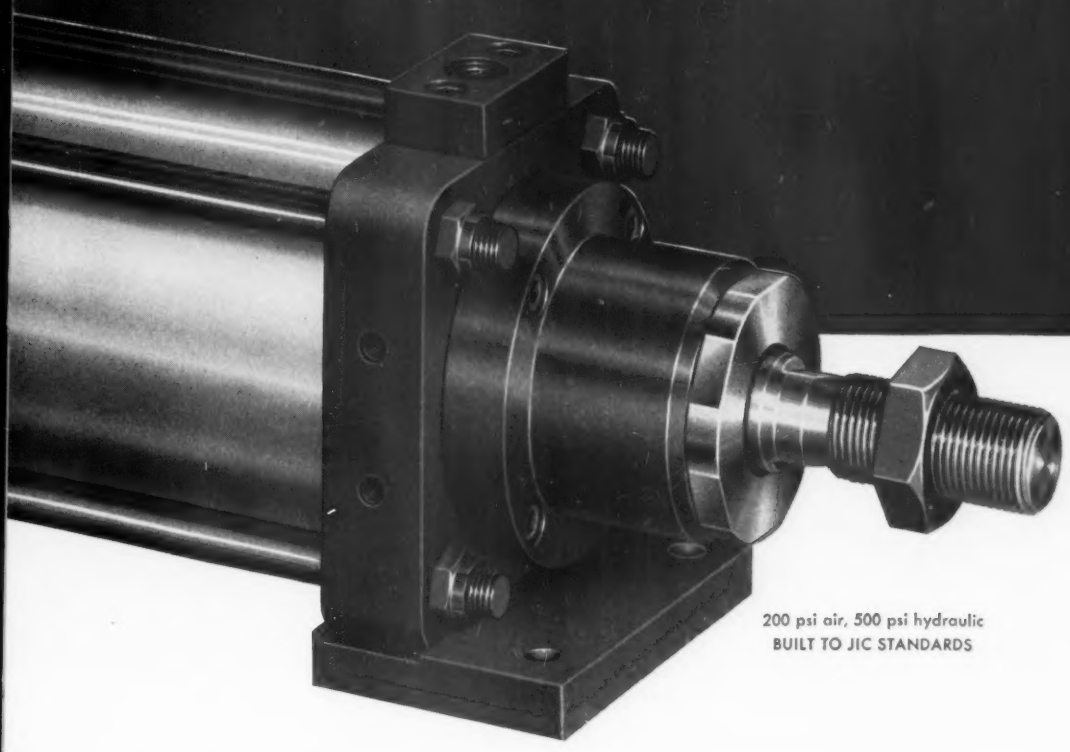
HEAVY-DUTY AIR AND HYDRAULIC CYLINDERS



200 psi air, 500 psi hydraulic
BUILT TO JIC STANDARDS

Here is a cylinder on which you can stake your reputation . . . built by Valvair, makers of famous SPEED KING control valves. With design features based on years of application engineering experience in high-production manufacturing operations, Valvair's new heavy-duty air and hydraulic cylinder offers performance, durability and ease of maintenance. Construction and component materials have been coordinated to assure efficient, trouble-free operation, plus longest service life with minimum machine downtime.

Built to JIC Standards and offering a full range of bore and rod sizes, interchangeable mounting styles, stroke lengths and cushioning options, you'll find Valvair heavy-duty cylinders ideal for your non-rotating cylinder applications. Take advantage of one-source responsibility for all your control system needs . . . cylinders, valves, manifolds, filters, regulators and lubricators . . . call in your nearby Valvair field engineer today.

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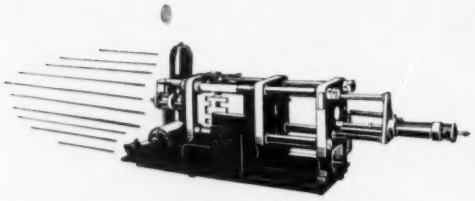
announcement



CAST-MASTER

H-P-M Division — Koehring Company

We are very happy to announce that Cast-Master, nationally known manufacturer of die casting machines and allied equipment, is now a part of Koehring Company and will operate as a division of the Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. Designers and builders of precision die casting machinery since 1939, Cast-Master is one of the oldest exclusive manufacturers of this type of machinery in the country. The increased use of die cast parts in the automotive, appliance, electronic and many other industries forecasts a growth potential that will be strengthened by this union with the Koehring Organization.

The complete line of Cast-Master die casting machines will continue to be manufactured at the Bedford, Ohio plant. Operating Management at Cast-Master remains unchanged.

HPM

H939

THE HYDRAULIC PRESS MFG. COMPANY

A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.

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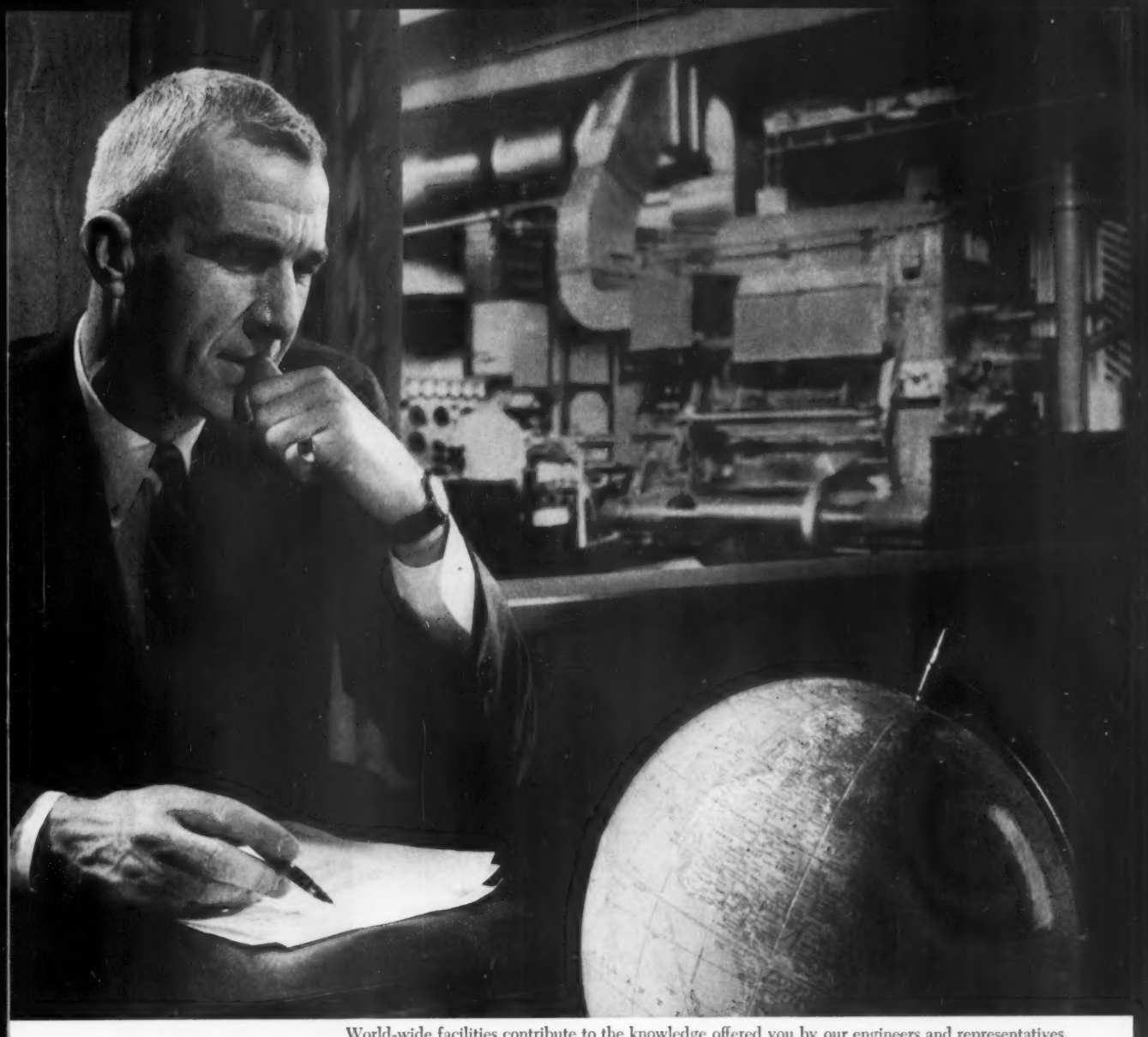

World-wide facilities contribute to the knowledge offered you by our engineers and representatives.

To aluminum fabricators...

who wonder who's watching the world for profitable new applications and alloys

This man—like every successful fabricator—is ever curious about the ways and means of working with aluminum. He's alert to new alloys, new methods, new applications.

But he sometimes wonders about the rest of the world. Is there in England, for example, or Canada, or somewhere in Europe, an alloy unknown to him—but measurably better than the "equivalent" he's now using? Is there some recent fabricating refinement, finishing method, or new end product use he should know about?

Watching for new aluminum opportunities—wherever they may exist—is another way that Aluminium Limited serves its U.S. customers, independent aluminum fabricators. Its representatives and engineers are kept informed by a day-to-day exchange of information among their company's world-wide affiliate organizations and research facilities.

For information, call or write the nearest office of Aluminium Limited Sales, Inc.

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Additional distribution (Alcan Foundry Alloys): **Apex Smelting Company,** Chicago, Cleveland, Los Angeles • **Charles Batchelder Co., Inc.,** Botsford, Conn.

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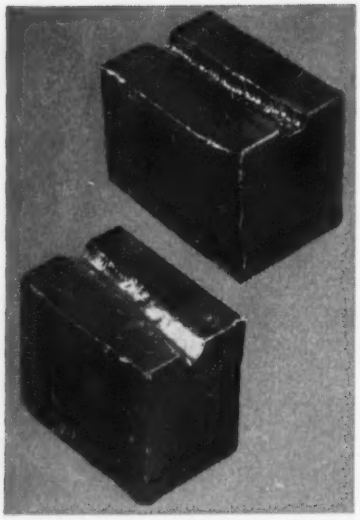

Which stainless steel block was grooved in 12 seconds?

It took 10 minutes to chip a ¼" deep, ⅜" wide groove in this 3¼" long stainless steel block on the left. Arcair did a better job in just 12 seconds . . . or 1/50th of the time. (See block at right.) Groove is 5/16" deep; 7/16" wide. Both blocks were cut from the same stainless.

You can groove, cut, gouge or bevel *any* metal faster with Arcair . . . get significant cost savings. Yet, the Arcair process costs less than $100.

HOW DOES ARCAIR WORK? The torch uses 80 p.s.i. air, welding machine current and special electrodes to melt and instantly blow away metal. There's no oxidation. New operators learn everything in 15 minutes.

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Arcair

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Send me more information on Arcair Torches and special electrodes.

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COMPANY_____
ADDRESS_____
CITY_____ STATE_____
MY PROBLEM_____

Circle 559 on Page 53

With the Editors

● **Another Crack at Castings:** At a time when tremendous problems, both at home and abroad, are facing the Congress of the United States, one wonders how individual Congressmen can get so far off base. Take the case of Frank C. Osmers Jr., representative from the North New Jersey District in the northeast corner of the state.

On April 10, Congressman Osmers took the time of the world's greatest deliberative body to present a speech supporting House Joint Resolution 179, which he introduced, authorizing and requesting "the President to designate the month of April in each year as National Welded Products Month."

Congressman Osmers went on in his introduction to say, "Such a designation will give recognition to the men and methods that are so vital to all of us. Not only are the household tasks of the American family speeded and lightened by a myriad of welded products and appliances, but our standard of living is based on the inexpensive and safe land, air and sea carriers made possible through welding. American industry as it exists today is built upon the use of welded machinery and equipment." And much, much more follows.

In fact, this little speech in what the *Wall Street Journal* refers to as "the entertainment theater on Capitol Hill," required 69 in. of type and approximately 2900 words in the *Congressional Record*, all at taxpayers' expense.

The climax of this little gem appears toward the end when he says, "*Castings are expensive parts in manufacturing processes, as any home mechanic knows.* The more complex the casting the greater the cost. Welding is saving costs in the casting industry because complex units can often be assembled by welding together two or more simpler castings."

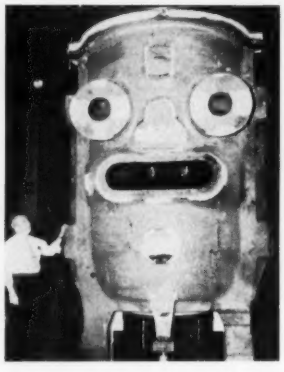
Steel foundrymen have had great success with cast-welded construction, but what about gray iron, malleable iron, and nonferrous castings? Should they be branded as "expensive parts in the manufacturing process" in the halls of Congress and the *Congressional Record* simply because a Congressman, who is expected to represent the well being of all industry, falls for the propaganda line of a trade association?

When a Congressman wants to appear silly, this is his privilege. But when he casts reflections on the economics of a product of one of our basic industries, he should be told.

I hope there are a few foundrymen in the North New Jersey District who can tell Congressman Osmers to confine his talks to facts, not propaganda.

—o—

Steel Mask: Areas marked to facilitate laying out locations for machining and drilling operations



make this steel casting look like a giant steel mask. The casting is a portion of a steam turbine high-pressure shell and will be used in a large electric power generator for the Caribbean Sea Area. The casting and the generator are being made by General Electric Co.

—o—

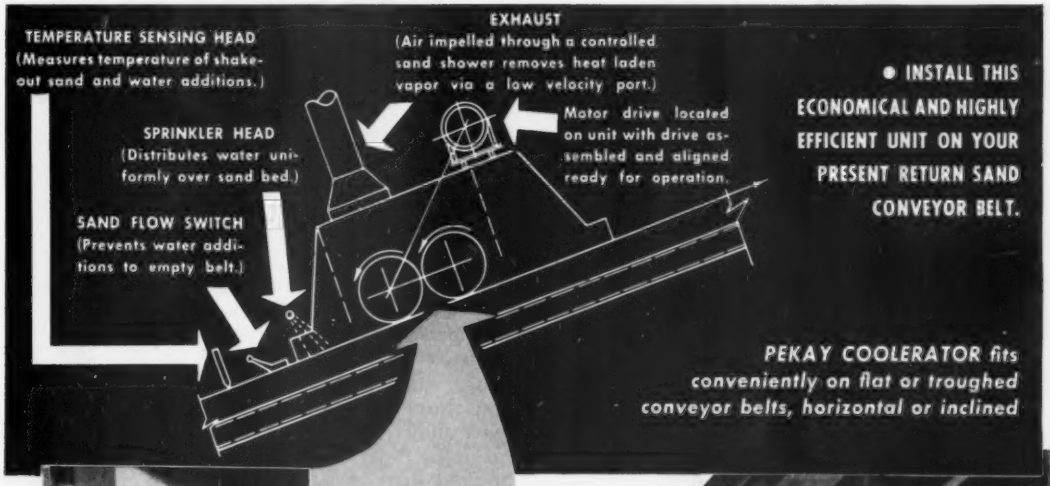
Prices: The evils of unintelligent price cutting seem to plague the foundry industries of other countries. For example, we noted the following editorial in the March 5 issue of our worthy contemporary, the *Foundry Trade Journal*, published in London, England.

PRICE-CUTTING

Periodically during its long history the *Foundry Trade Journal* has had to call attention to the irreparable damage done

NOW!

YOU CAN ELIMINATE THE HOT SAND PROBLEM IN YOUR FOUNDRY—WITH THE PEKAY COOLERATOR WHICH WILL EFFECTIVELY COOL MORE SAND PER DOLLAR INVESTED


TEMPERATURE SENSING HEAD
(Measures temperature of shake-out sand and water additions.)
EXHAUST
(Air impelled through a controlled sand shower removes heat laden vapor via a low velocity port.)
SPRINKLER HEAD
(Distributes water uniformly over sand bed.)
Motor drive located on unit with drive assembled and aligned ready for operation.
SAND FLOW SWITCH
(Prevents water additions to empty belt.)

• INSTALL THIS ECONOMICAL AND HIGHLY EFFICIENT UNIT ON YOUR PRESENT RETURN SAND CONVEYOR BELT.

PEKAY COOLERATOR fits conveniently on flat or troughed conveyor belts, horizontal or inclined

MIXING
(Rapidly revolving cutter wheels break all lumps, thoroughly, aerate and distribute moisture throughout sand.)

The **PEKAY COOLERATOR** installation at **CLARK EQUIPMENT COMPANY'S** Steel Foundry, Buchanan, Michigan, cools return sand from a peak of 250° F to 115° F at the rate of 60 T. P. H.

BENEFICIAL FEATURES OF THE PEKAY COOLERATOR

- *Rapid sand cooling without retention time* • *Reduce mixing time in mill*
- *Insure closer sand quality control* • *Increase conveyor belt life*
- *Simplicity of installation* • *Low operating and maintenance cost*

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869 N. SANGAMON STREET **CHICAGO 22, ILLINOIS**

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☐ Pekay Sand Systems ☐ Pekay Airators
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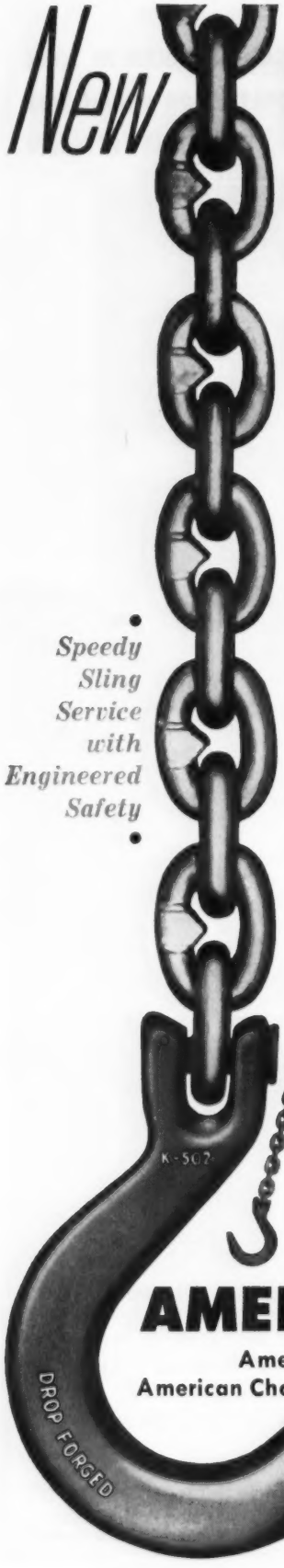


New **KUPLEX**

Sling Chain Assemblies WITH Foundry Hooks

Made for trunnions and other foundry uses

• Chain sling assemblies that are "tailor-made" to your own foundry requirements are as near to you as your telephone!

Your nearby Kuplex distributor can furnish you with Kuplex sling chain assemblies made with drop-forged alloy steel foundry hooks in 6 sizes: ¼" to ⅞". Kuplex foundry hooks are engineered to be as strong as the chain itself—as are all the components which go into a Kuplex sling chain assembly. Kuplex foundry hooks are forged into a round at the point for easy insertion into casting holes.

Find out about the many advantages of ACCOLOY Kuplex Sling Chains from your authorized Kuplex distributor. Assembled locally of matched and engineered components, each part in a Kuplex sling assembly is designed and engineered specifically for use with all other parts. Each part is made from heat-treated ACCOLOY steel and proof-tested at twice working-load limits.

Kuplex Sling Chains made of ACCOLOY 125 chain are available in six sizes (¼" to ⅞") in single, 2-leg, 3-leg and 4-leg styles.

Speedy Sling Service with Engineered Safety

ACCO Foundry Hooks can also be furnished on ACCO Registered SLING CHAINS

***Write** our York, Pa., office for the name of the Authorized Kuplex Sling Chain Distributor nearest to you*

AMERICAN CHAIN

American Chain Division
American Chain & Cable Company, Inc.
Bridgeport, Conn.
Factories: *York and Braddock, Pa.

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

*Indicates Warehouse Stocks

ACCO

to the industry during periods of recession by insensate price-cutting, and letters to the Editor, published elsewhere in this *Journal* refer to flagrant examples of this evil.

The excuses given by those accused of price-cutting are various, but the one most often used is the argument that only in this way can employees be found work. We remember this being put forward by a few founders who were prosecuted for buying scrap at prices above the controlled maximum. The latter action was against the law of the land, whilst excessive price-cutting is contrary to commercial morality and is equally reprehensible.

Everybody welcomes price reductions provided they are economic, but when a simple calculation shows that they barely cover raw materials and labour, let alone overheads, price-cutting is immoral, because whilst it lowers the financial standing of the price-cutters, it adversely influences the whole price structure of the industry by giving the purchasing agent a background of false values. If the price-cutter imagines that his guesswork is better than figures derived from a proper costing system, he is a candidate for a mental home, for he is just presenting pound notes to the customer with every batch of castings he delivers.

Cases have been brought to our notice, where gunmetal castings have been bought at a price lower than the combined value of the copper and tin content. Purchasing agents should be wise to the fact that they will not receive proper satisfaction from such offers and, sooner or later, the source of such goods will dry up. Then when trade expands, they will find their castings requirements of but little interest to the reliable suppliers, and the onus of entertaining will again devolve upon the buyer and not the salesman.

We address this subject as much to buyers of castings as to foundrymen, with the recommendation that if the former is on a good wicket, he should go on batting. Sticky wickets are fraught with danger!

—o—

For Outstanding Work: Congratulations to George L. Sall, president, George Sall Metals Co., Philadelphia, on being given the Man of the Year Award by the Jewish War Veterans of Philadelphia County for his outstanding charity work.

—o—

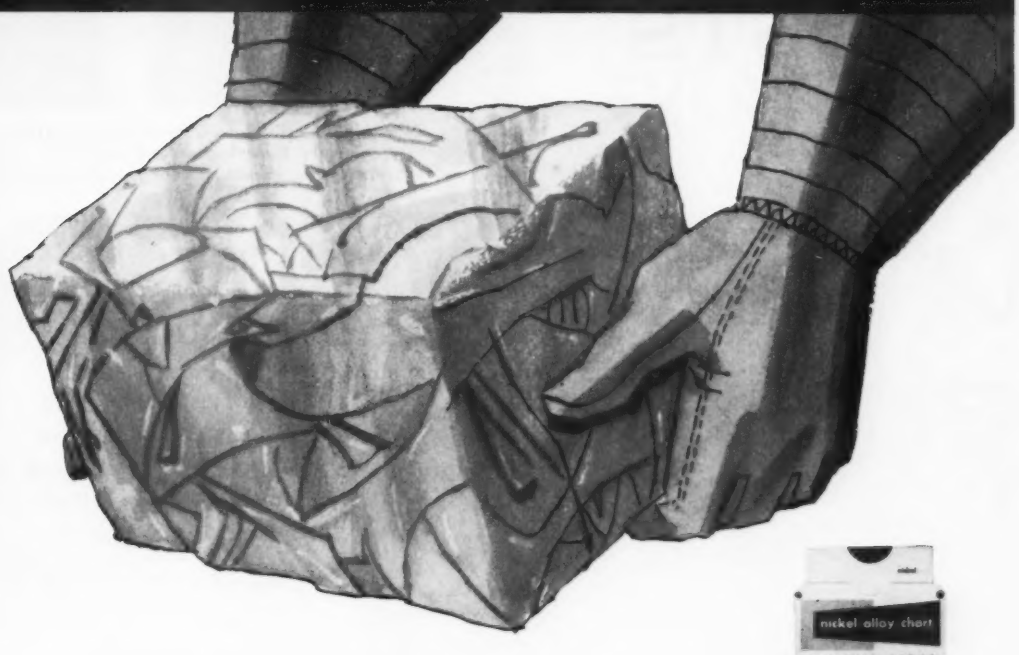
Lazy Days: F. Kermit Donaldson, executive vice president, Steel Founders' Society of America, started his report at the annual meeting by quoting from a plaque he noted on a vacation in Mexico: "Que bonito es no hacer nada, y despues de no hacer nada descansar." Freely translated, Kermit says this means, "How beautiful it is to do nothing, and after doing nothing, to rest."

And it is the good old summer time. F.G.S.

Foundrymen–

Pre-Alloyed Furnace Charges

at a cost less than the price of their original components!

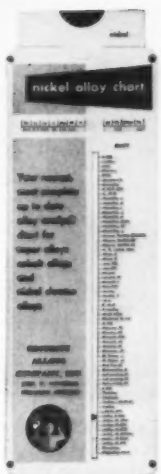


Quality Controlled Stainless and Nickel-Cobalt Alloys in Briquettes, Cut Plates, Stampings and other forms

• These Pre-Alloyed Furnace Charges from Security Alloys, pioneer processors of alloyed nickel, will help reduce your melting time because of their high density and uniform analysis. Tailor-made to most commercial and military specifications, requiring fewer foundry additives and permitting easier prediction of casting analysis.

Color-coded and packaged to your requirements at no extra cost.

For more information on how our Pre-Alloyed Furnace Charges can save you time and money, Write to Foundry Division, Security Alloys Company, Inc., 3100 West 49th Place, Chicago 32, Illinois or phone PRospect 6-8500.



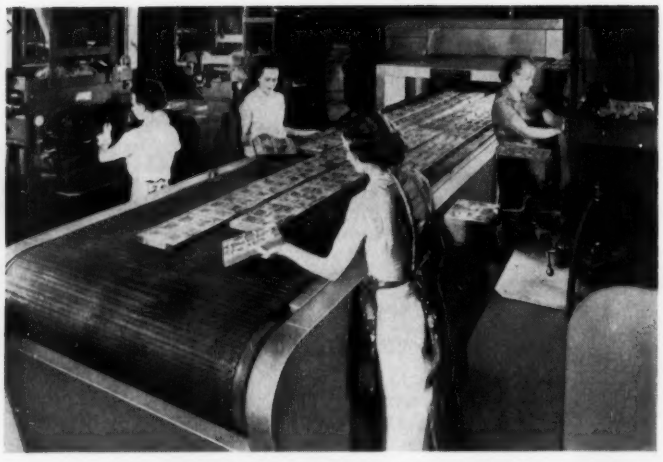
SEND FOR FREE POCKET-SIZE ALLOY SLIDE CHART
Complete analysis of over 100 nickel-cobalt alloys

SECURITY ALLOYS CO. INC.

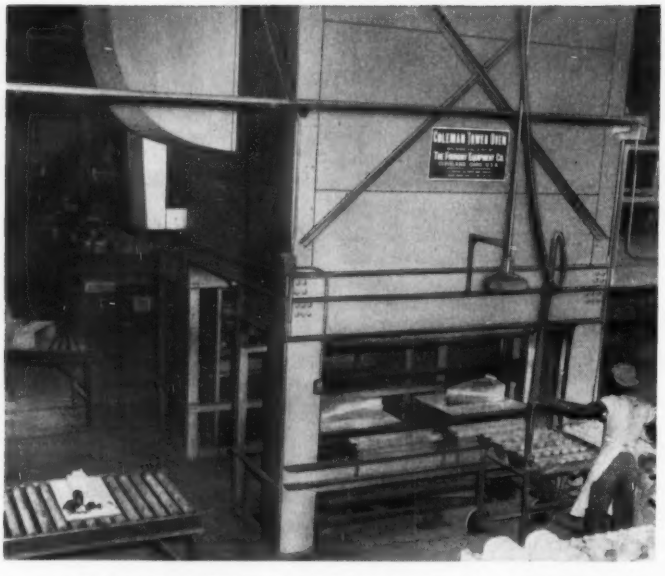
FOUNDRY DIVISION

Circle 562 on Page 53

CUT LABOR COSTS with Coleman Conveyor Core Ovens



Coleman Dielectric Core Oven in leading plumbing fixture foundry. Direct labor alone reduced by 75%, with many other important savings and advantages.



Coleman Tower® Core Oven. One of two large installations in a major steel foundry. Mechanized handling and baking of cores up to 150 pounds at substantial annual savings.

● Performance records in all types of foundries prove that Coleman Conveyor Core Ovens reduce core department costs by as much as 50%!

Coleman Ovens quickly pay for themselves out of direct savings in labor, materials and reduced casting scrap.

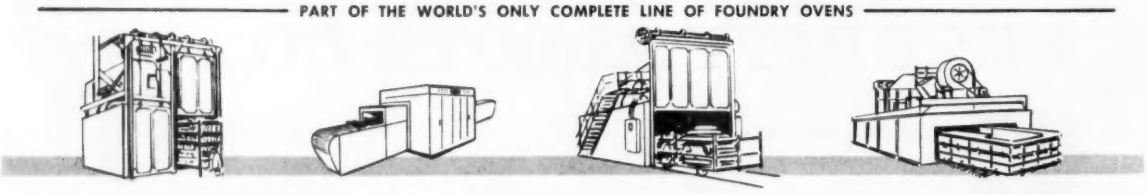
As builders of the world's only complete line of foundry ovens . . . dielectric or recirculating heat . . . we can recommend, without bias, the right oven for your particular needs.

WRITE FOR BULLETIN 54

THE FOUNDRY EQUIPMENT COMPANY • 1821 COLUMBUS ROAD, CLEVELAND 13, OHIO

World's Oldest and Largest Foundry Oven Specialists—More than half a century of specialized foundry experience.

PART OF THE WORLD'S ONLY COMPLETE LINE OF FOUNDRY OVENS



TRANSRACK OVENS | DIELECTRIC CORE OVENS | CAR TYPE OVENS | JET ACTION MOLD OVENS

POSITIVE DUPLICATION – EVERY TIME!

From a given point, the needles of these compasses always point to the earth's magnetic poles . . . an important aid to exploration and navigation.

The (PD)° marking on these CINCINNATI Swing Frame grinding wheels (and *all* CINCINNATI WHEELS) points to an important and remarkable quality . . . Positive Duplication, time after time after time.

CINCINNATI (PD) WHEELS do a better job for you, because 36 separate quality control steps in the unique (PD) process result in wheels of unsurpassed uniformity.

COSTS GO DOWN—STAY DOWN

Your cleaning room costs go down when you use (PD) wheels. They last longer.

Costs *stay* down, because each reorder wheel will act and grind exactly like the original wheel . . . thanks to Positive Duplication.

They are smoother cutting, too. All factory-balanced (PD) wheels (12″ and up) are marked "TOP" to help your operator correctly fit wheel to spindle for smoother, safer operation.

CALL CINCINNATI

Could you use help in cutting costs? A Cincinnati grinding specialist will be happy to work with you in finding the best grading for your swing frame, stand and portable grinders. Call your CINCINNATI (PD) GRINDING WHEELS distributor *today*, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

(PD) POSITIVE DUPLICATION

CINCINNATI°

GRINDING WHEELS

°Trade Mark Reg. U. S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Circle 564 on Page 53

WHY PAY MORE

when you can buy the best binder at the lowest price!

INSIST ON STEINEX

the original CO_2 Binder available only from Carver

BEST QUALITY Steinex gives you absolutely the best shakeout —BY FAR!

BEST PRICE Steinex is 30% lower in cost than any other binder on the market!

BEST SERVICE Carver has the in-the-foundry experience and know-how to help you use Steinex in your CO_2 operation — successfully and profitably!

JOIN THE HUNDREDS OF FOUNDRIES THAT INSIST ON THE BEST

MAIL TODAY

CARVER FOUNDRY PRODUCTS CO.
Muscatine, Iowa

RUSH information and prices on Steinex binders.

NAME _____ TITLE _____

FOUNDRY _____

CITY _____ STATE _____

CALENDAR of Meetings

June 9-12—Institute of British Foundrymen, annual conference, Scarborough, England.

June 9-12—Material Handling Institute, 1959 Exposition, Public Hall, Cleveland.

June 18-20—American Foundrymen's Society, 4th Foundry Instructors Seminar, University of Illinois, Urbana, Ill.

June 21-26—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

June 22-26—Air Pollution Control Association, annual meeting, Statler Hilton Hotel, Los Angeles.

June 23—Hoist Manufacturers Association, Statler Hilton Hotel, Buffalo.

June 25-27—Penn State Foundry Conference, Pennsylvania State University, University Park, Pa.

Sept. 21-22—Steel Founders' Society of America, fall meeting, Homestead, Hot Springs, Va.

Sept. 21-25—Instrument Society of America, annual Instrument-Automation Conference and Exhibit, International Amphitheatre, Chicago.

Sept. 24-25—Missouri Valley Regional Foundry Conference, Missouri School of Mines & Metallurgy, Rolla, Mo.

Oct. 1-2—Central New York Regional Foundry Conference, Drumlins Country Club, Syracuse, N. Y.

Oct. 4-10 — International Foundry Congress, organized by Spanish Institute of Iron & Steel, Madrid, Spain.

Oct. 7-9—Gray Iron Founders' Society, annual meeting, Fairmont Hotel, San Francisco.

Oct. 8-9—Michigan Regional Foundry Conference, Pantlind Hotel, Grand Rapids, Mich.

Oct. 10-13 — Conveyor Equipment Manufacturers Association, annual meeting, Grand Hotel, Point Clear, Ala.

Oct. 11-16—American Society for Testing Materials, Pacific area national meeting, Sheraton-Palace Hotel, San Francisco.

Oct. 15-17—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier, White Sulphur Springs, W. Va.

Oct. 16-17—New England Regional Foundry Conference, Massachusetts Institute of Technology, Cambridge, Mass.

Oct. 21—Cast Bronze Bearing Institute, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

Oct. 22-23—Ohio Regional Foundry Conference, Deshler-Hilton Hotel, Columbus, Ohio.

Oct. 23-24—Non-Ferrous Founders' Society, annual meeting, Bedford Springs Hotel, Bedford Springs, Pa.

Oct. 29-30—Purdue Cast Metals Conference, Purdue University, Lafayette, Ind.

Nov. 2-6—American Society for Metals, National Metal Exposition & Congress, International Amphitheatre, Chicago.

Nov. 6-7—National Foundry Association, annual meeting, Hotel Roosevelt, New York.

Nov. 9-11—Steel Founders Society of America, Technical & Operating Conference, Carter Hotel, Cleveland.

Nov. 16-20—International Automation Congress & Exposition, New York Trade Show Building, New York.

Dec. 2—Electric Overhead Crane Institute, annual meeting, Carlton House, Pittsburgh.

Circle 565 on Page 53

10 hours' work in an 8-hour shift!

That's the production advantage of the Yale Industrial Tractor Shovel

Here are the features that make the Yale Industrial Tractor Shovel outstanding...

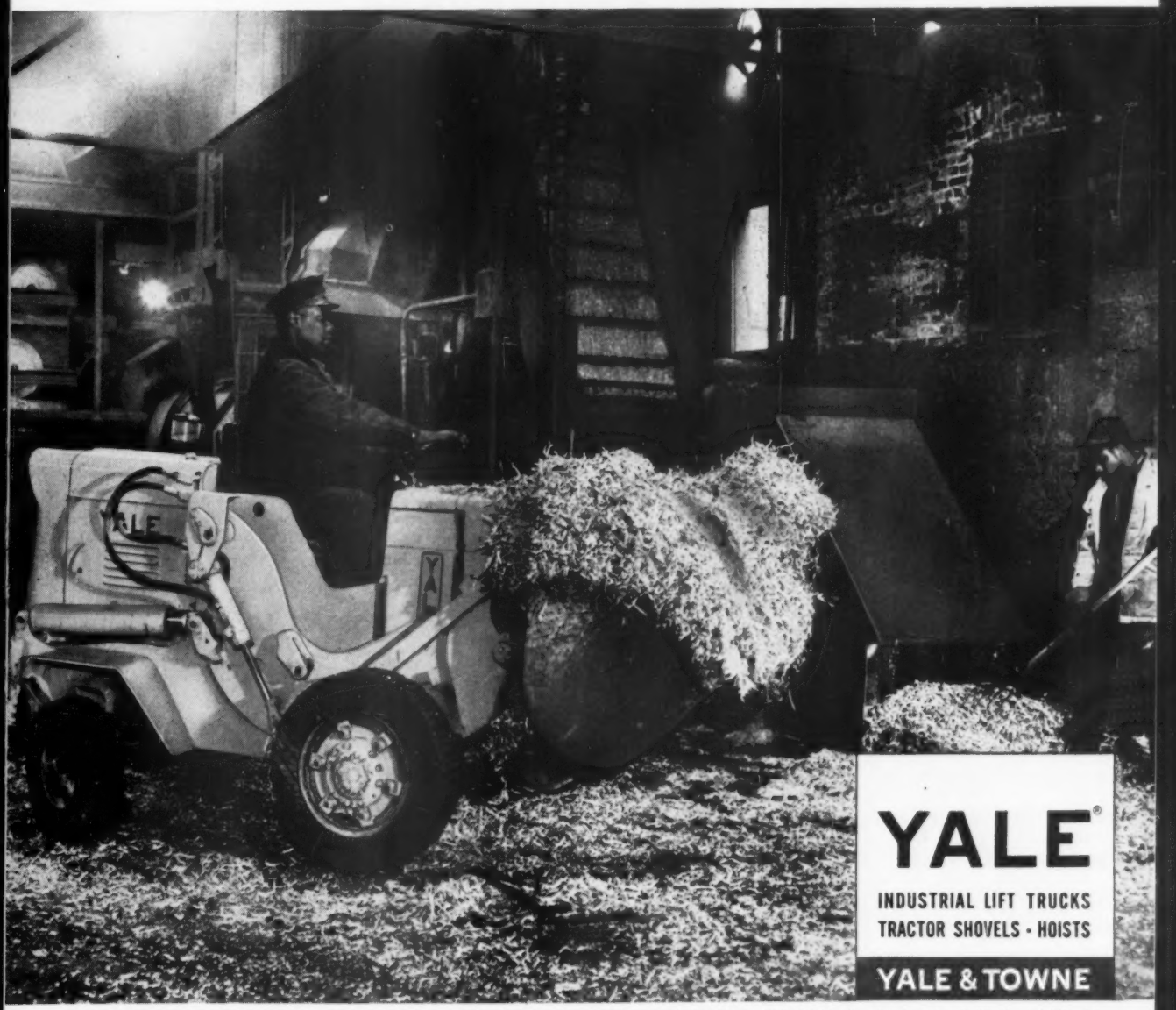
PRECISELY CONTROLLED HORSEPOWER! 72 hp. 6 cylinder engine provides smooth power through matched torque converter and Yale torque transmission (fully automatic). One speed in both directions. Inching control permits delicate close-quarter maneuvering. Extra punch for impact loading. Accelerates to 13 mph. in 5½ seconds.

PERFORMANCE! 2500 lb. carry capacity. Exclusive 45° bucket tipback permits faster loading and lowest carry position for faster transport with minimum spillage. 6′ dumping clearance permits dumping into bins and hoppers out of range of other—even larger—tractor shovels. Shortest turning radius, too—only 73″.

SAFETY! Safety-curve lifting mechanism members never rise alongside the operator. Front and back working lights provide extra security.

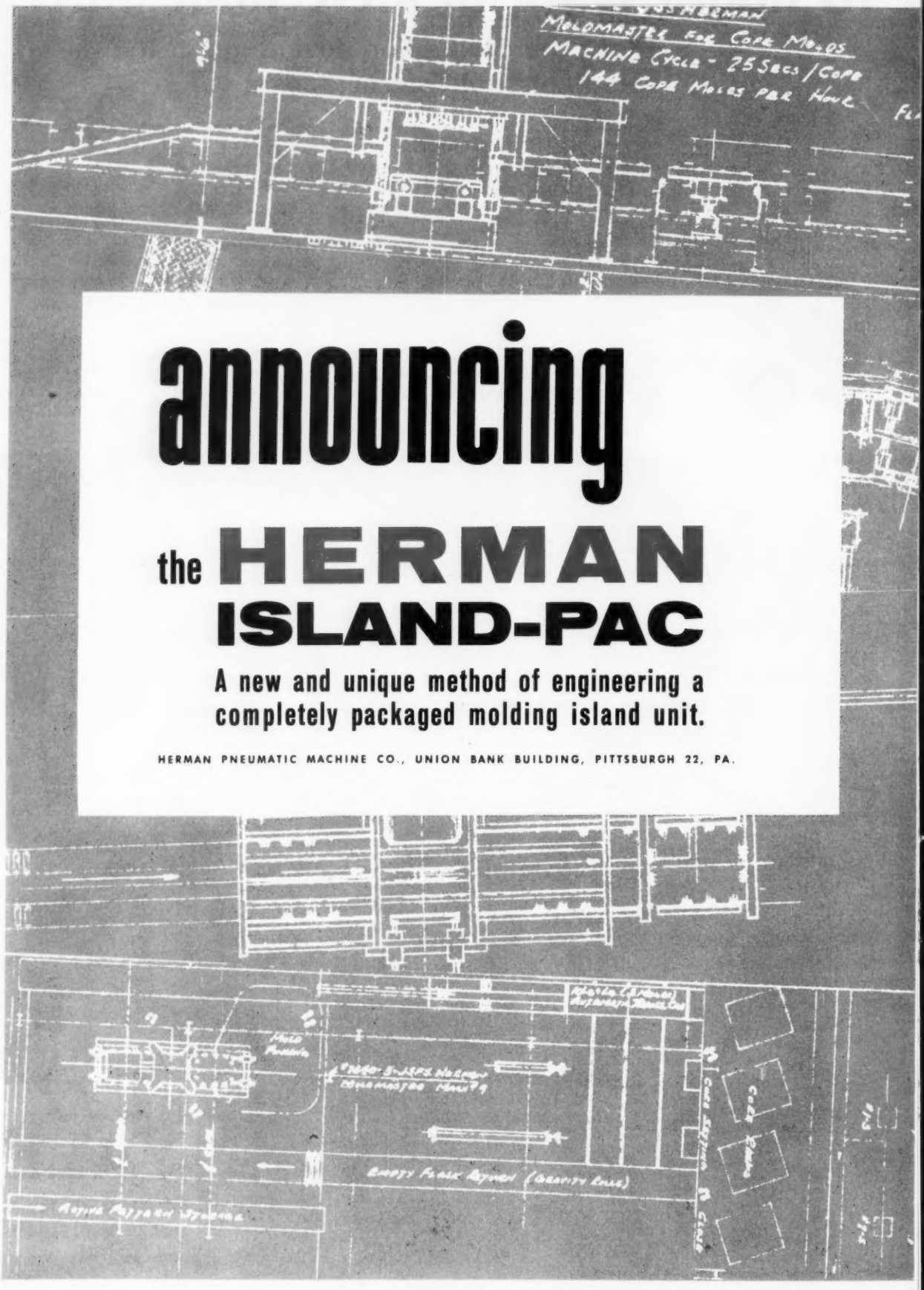
DEPENDABILITY! Rugged design • sealed brakes and electrical system • protected steering linkage • 10 ply tires—all adds up to more work at less cost...more production hours. Full range of buckets and attachments available.

Field applications prove that these features add up to 25% more work per hour—10 hours' work in an 8-hour shift. For a demonstration in your plant or complete information contact your Yale representative. Or write The Yale & Towne Mfg. Co., Yale Materials Handling Division, Phila. 15, Pa., Dept. YT 2-V.



Yale Materials Handling Division, a division of The Yale & Towne Manufacturing Company. **Manufacturing Plants:** Philadelphia, Pa., San Leandro, Calif., Forrest City, Ark.
Products: Gasoline, Electric, Diesel and LP-Gas Industrial Lift Trucks • Worksavers • Warehousers • Hand Trucks • Industrial Tractor Shovels • Hand, Air and Electric Hoists

Circle 566 on Page 53



announcing

the HERMAN ISLAND-PAC

A new and unique method of engineering a completely packaged molding island unit.

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH 22, PA.

Here's What We Do:

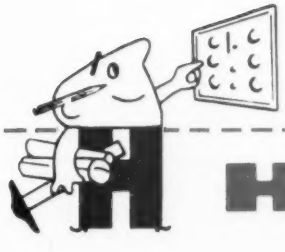
1. We visit your foundry and analyze your molding requirements.
2. Check your pattern equipment.
3. Make engineering layouts.
4. Estimate cost and manpower needs.
5. Manufacture the molding equipment and accessories for a complete molding island.
6. Furnish the equipment.
7. Provide supervisory assistance on installation and initial start-up.

The HERMAN ISLAND-PAC principle is designed to save you time and trouble, in developing a molding island unit for your specific foundry operation.

Efficient, cost-saving units have already been engineered for many production and semi-production foundries.

The HERMAN ISLAND-PAC takes the worry off *your* back.

Write us for further details.



HERMAN

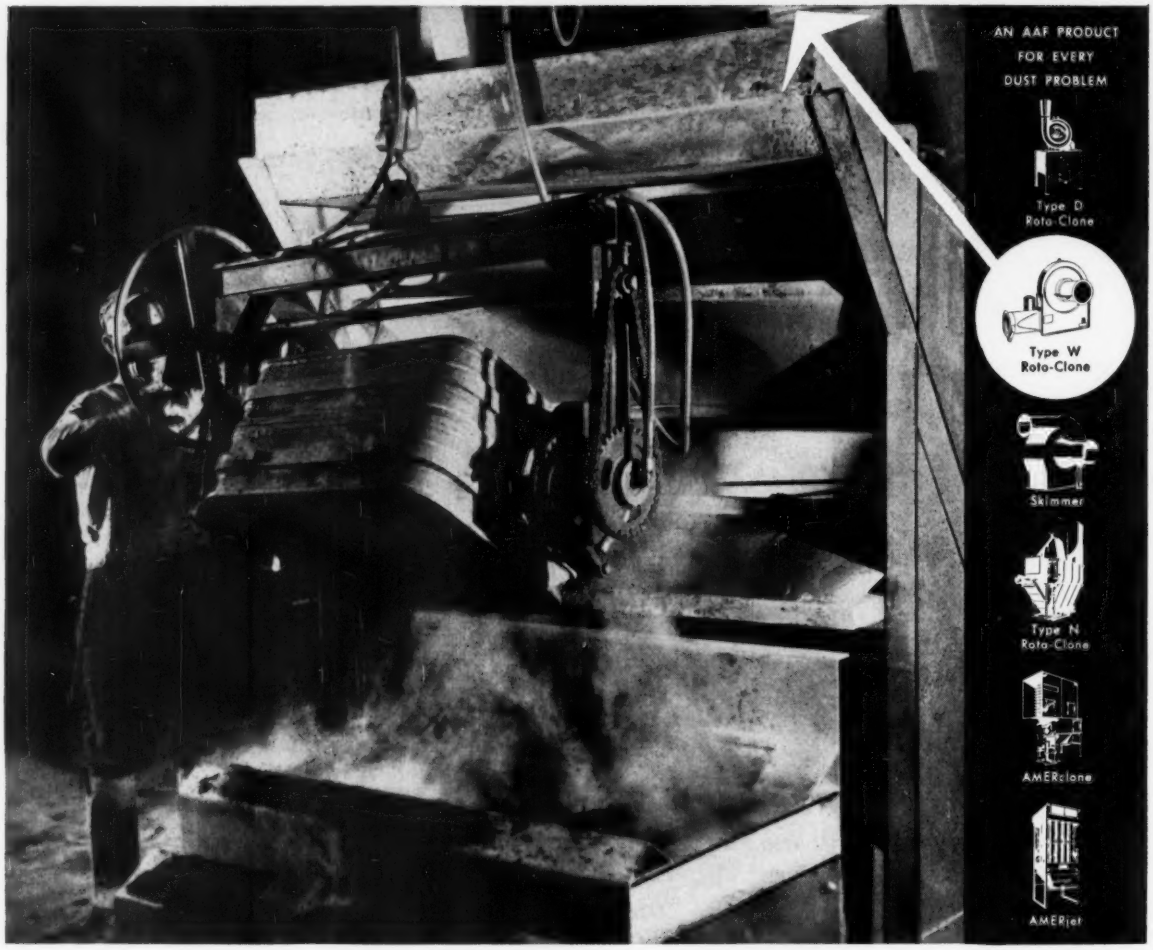
FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION INC. MEMBER FEMA

and most progressive

Best Known Name in Engineered Molding Machines

Circle 567 on Page 53

SHAKEOUTS



AAF Type W ROTO-CLONE takes shakeout dust in tow!

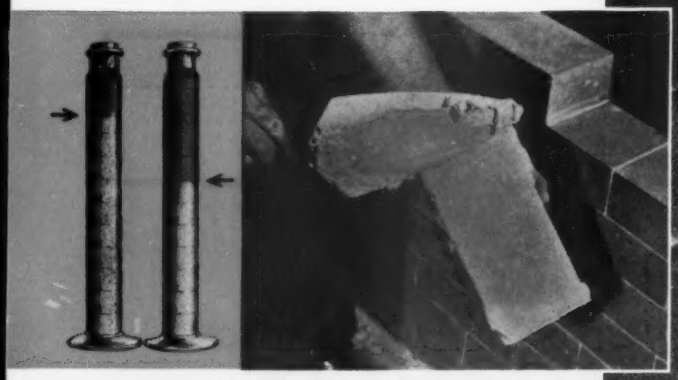
● AAF's wet-collecting Type W ROTO-CLONE is the No. 1 enemy of foundry shakeout dust. Its high efficiency, low cost, and small space requirement make it a "natural" for this application.

Water sprays extend the effectiveness of the Type W's dynamic forces to the collection of the very lightest and finest dust particles. It requires little maintenance, uses a minimum of water, and maintains its efficiency regardless of air volume.

AAF's complete line of dust control equipment was application-developed, now challenges *any* foundry dust problem. If *your* problem is shakeout dust, call your local AAF representative or write direct for Type W ROTO-CLONE Bulletin 274B. Address: Mr. Robert Moore, American Air Filter Company, Inc., 266 Central Avenue, Louisville, Ky.

AAF American Air Filter
BETTER AIR IS OUR BUSINESS

Circle 568 on Page 53



1. Settling test (as shown) demonstrates that ANKORITE 65 remains longer in suspension, a valuable characteristic of a hot-setting mortar. ANKORITE 65 in the graduate on the left, shows no settling, while ordinary mortar in the other tube has settled considerably in the same time.
2. ANKORITE 65 spreads smoothly and well, making uniform joints of the thickness desired.
3. View of malleable furnace wall of high-quality super-duty fireclay brick laid with ANKORITE 65. The unusual resistance of this mortar to severe slagging action and erosion is illustrated by the joints which extend beyond the brick.

Harbison-Walker Ankorite 65

The new WIDELY-USED bonding mortar • more refractory • more workable • more durable • for super-duty and high-alumina brick

The protruding mortar joints of the furnace wall in the photograph illustrate the exceptional durability of ANKORITE 65. This shows a portion of a malleable furnace wall of high-quality super-duty fireclay brick laid with this mortar. As is obvious, after the normal period of service, the mortar has been less eroded than the brick.

ANKORITE 65 is a high-alumina heat-setting mortar which develops a strong ceramic bond of high resistance to slag corrosion and to severe erosion of metal and slag at high temperatures.

ANKORITE 65 is used with splendid results for laying bottom blocks and linings of blast furnaces up to the mantle. It is particularly suited for laying various alumina-silica brick linings of transfer ladles, for electric furnace roofs, and for malleable and air furnace side walls and bottoms. The good workability of this mortar lends itself to easy trowelling or dipping in securing strong impervious joints. In some applications it is used with benefit for protective coatings by spraying or brushing.

The Garber Research Center

Leadership in refractories through constant research

Harbison-Walker Refractories Company

AND SUBSIDIARIES *World's Most Complete Refractories Service*

GENERAL OFFICES: PITTSBURGH 22, PENNSYLVANIA

Circle 569 on Page 53

A Lester B. Knight & Associates, Inc. Case History

FOUNDRIES CAN INCREASE PRODUCTION WITH LESS MANPOWER

Improved methods, layout, facilities and procedures will enable your foundry operation to meet today's demand for increased production and lower costs.

Knight Engineers have assisted many foundries to modernize methods, facilities and procedures to increase unit and total production, for gray and malleable iron, steel, brass and bronze, aluminum and magnesium castings.

Knight Engineers have revised existing incentive plans and installed new, equitable job evaluation, labor control and wage incentive plans which have resulted in increased production, lower costs and improved labor relations.

For consultation on any foundry problem, large or small, call on Lester B. Knight & Associates, Inc.

KNIGHT SERVICES INCLUDE:

Foundry Engineering • Architectural Engineering • Construction Management • Organization Management • Industrial Engineering • Wage Incentives • Cost Control • Standard Costs Flexible Budgeting • Production Control • Modernization • Mechanization • Methods Materials Handling • Automation • Survey of Facilities • Marketing

Lester B. Knight & Associates, Inc.

Management, Industrial and Plant Engineers

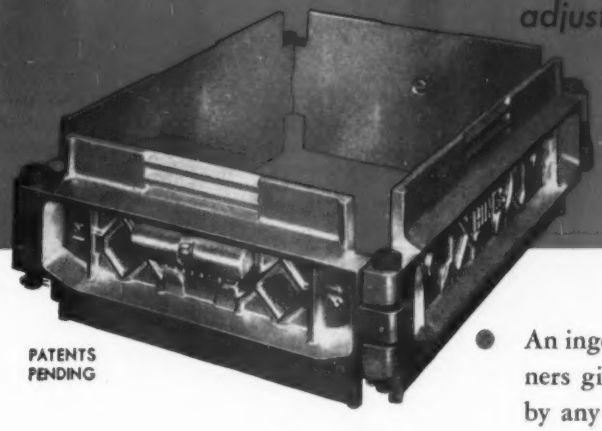
Member of the Association of Consulting Management Engineers, Inc.

549 W. Randolph St., Chicago 6, Ill.
917 Fifteenth St., N.W., Washington, D.C.
New York Office—Lester B. Knight & Associates, 375 Fifth Ave., New York City 16
Knight Engineering Establishment (Vaduz), Zurich Branch, Bahnhofstrasse 17, Zurich, Switzerland
Lester B. Knight & Associates, G.M.B.H., Berliner Allee 47, Düsseldorf, Germany

Circle 570 on Page 53

HINES "HI-FLEX" CAST JACKETS

Upon application to the mold, the "HI-FLEX" instantly assumes the exact shape of the mold and automatically adjusts itself to the taper of the mold.



PATENTS PENDING

One of many **HINES** *developments contributing to better foundry production*

- An ingenious pivot-pin arrangement at its four corners gives the "HI-FLEX" a flexibility unmatched by any other jacket on the market.
- Its fit on the mold can easily be changed by replacing corner pins with pins of larger or smaller diameter.
- Replaceable corner pins also permit adjusting the "HI-FLEX" to fit either slip or "POP-OFF" molds.
- Cast of aluminum or iron — jig and fixture built for maximum accuracy.
- End and side castings may be purchased separately. Filleted corner inserts and steel corner protection shields are also available.
- Lengths and widths, 10" to 30". Depths, 6", 8½", 11" and 13½". Special depths available, in half inches.

WRITE FOR CATALOG FOLDER NO. 203

THE HINES FLASK CO.

3431 WEST 140th STREET • CLEVELAND 11, OHIO

HINES FLASKS

Circle 571 on Page 53

depending on size and shape

CASTINGS require DIFFERENT CHILLS

there's a type of ...for every

to accomplish these same results...

1. Cool sections of unequal thickness at the same rate.
2. Prevent "shrinks" or pipes".
3. Prevent "blows" or sponginess.
4. Prevent surface cracks or leaks.
5. Strengthen sections by increasing rate of solidification.

With the proper chills you improve casting quality and strength . . . step-up production . . . reduce scrap!

every size . . . every type

Often . . . for the "want" of the right chill, expensive castings are "lost." The proper cooling of intricate castings is not a matter of guesswork but of applying known, pretested methods of chilling.

Fanner, through 65 years of experience in the foundry field, has developed the correct chill for every size and shape of casting — today, offers the

THE FANNER

The Fanner Chill Catalog describing the complete line is yours upon request.

FAN-S-CHILLS

FINE FANNER CHILL

casting requirement

...to do the job best

widest range of chills in the industry. Only four types are illustrated, but in the Fanner line you will find the *exact* chill to meet your particular need.

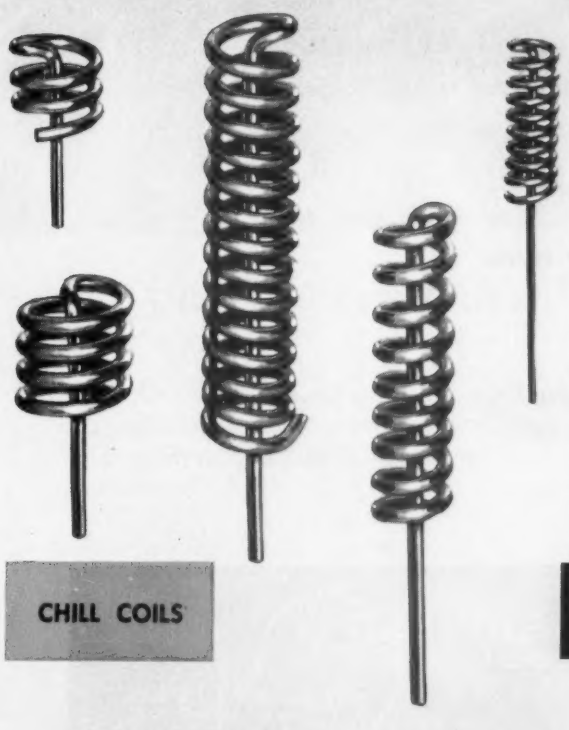
To get top quality castings, don't use just "any" chill. Ask Fanner to show you "which" chill you need — and "why". It costs you nothing to get the benefits of our specialized experience. Call or write today.

MANUFACTURING COMPANY

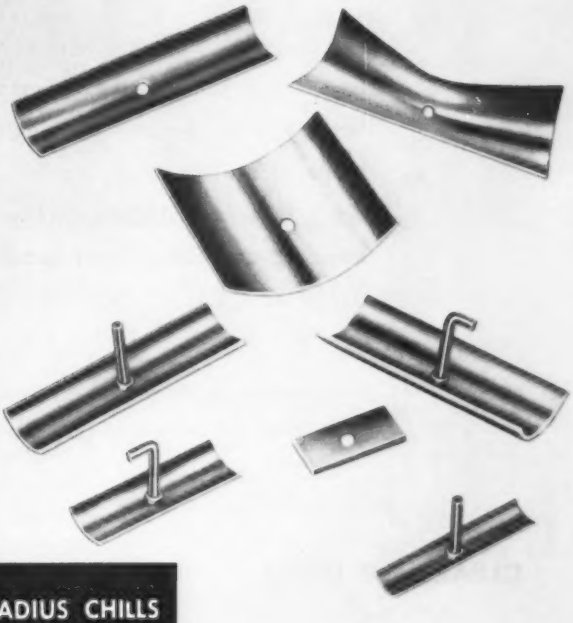
Designers and Manufacturers of
Fine Fanner Chaplets and Chills

BROOKSIDE PARK CLEVELAND 9, OHIO

SUPERCHILLS

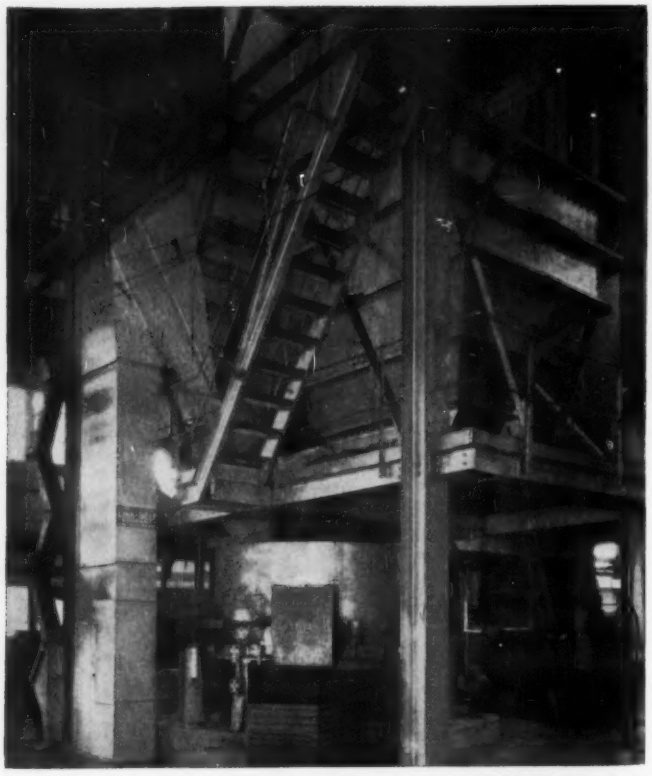


CHILL COILS



RADIUS CHILLS

Circle 572 on Page 53



930 Clearfield in a modern Steel Foundry in Michigan

The CLEARFIELD Mixer

Improves your continuous sand handling system

Clearfield Mixers mean greater efficiency in sand handling. By efficiency, we mean higher quality sand at a faster production rate, thereby lowering costs. Constant delivery of prepared sand is made possible by Clearfield's short mixing cycle. Clearfield Mixers perform perfectly in the most demanding continuous sand handling system.

For complete details write today for Catalog No. 90. There is a Clearfield Mixer for every sand preparation need.

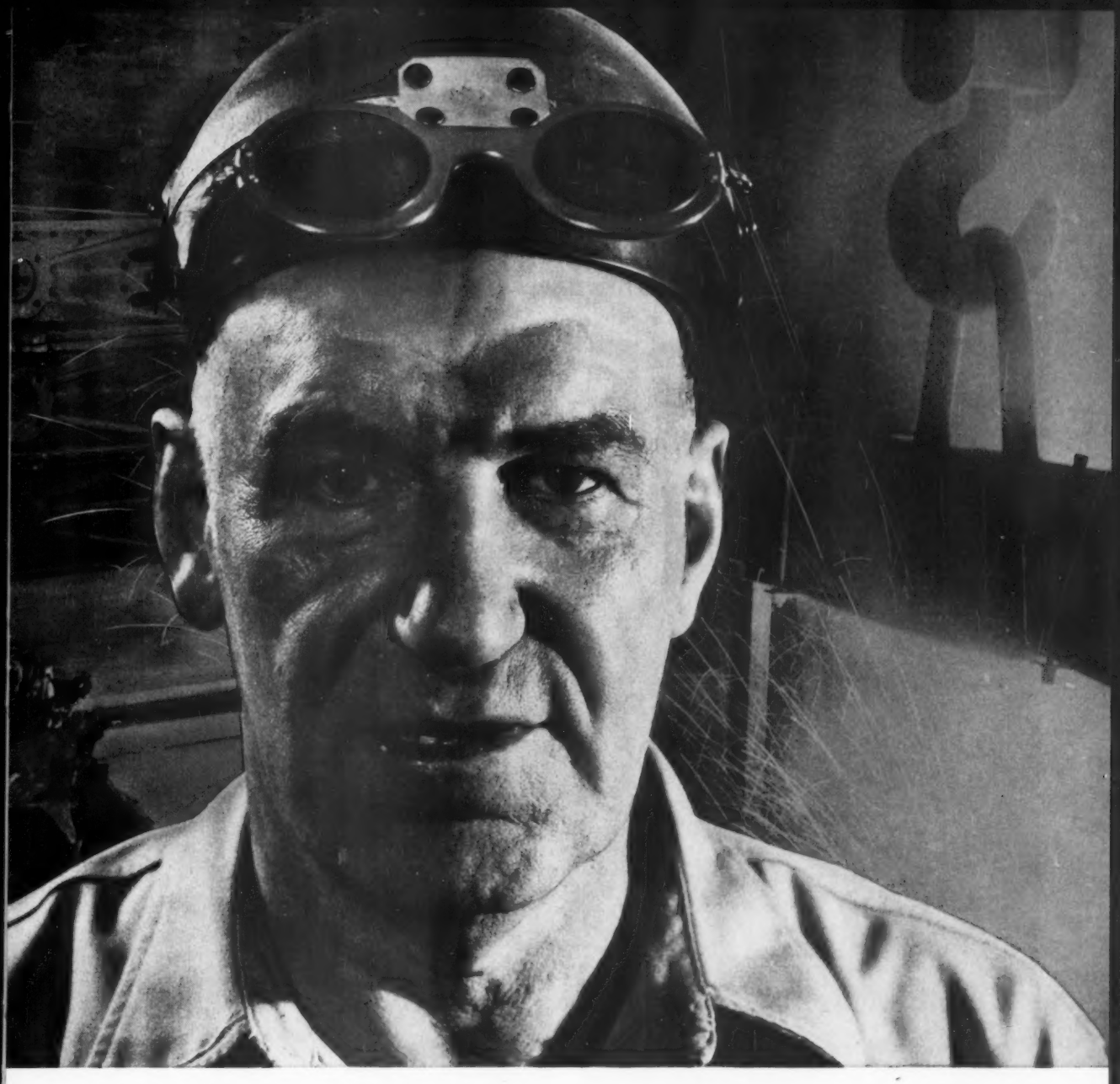
CLEARFIELD MIXER

the choice of
industrial leaders

CLEARFIELD
MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A.

Circle 573 on Page 53

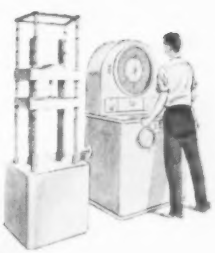


"I always get good ductility using calcium alloys"

Steel foundries employing aluminum deoxidation obtain improved properties by making a supplementary addition of calcium-silicon or calcium-manganese-silicon to the ladle. These calcium alloys help obtain consistently good ductility in the tensile test. Many foundries also report improved fluidity with the calcium additions. Generally 3 to 5 lbs. of alloy per ton insure effective treatment.

UNION CARBIDE METALS COMPANY, Division of Union Carbide Corporation, 30 East 42nd St., New York 17, N. Y.

Contact your UNION CARBIDE METALS representative for further information on getting improved ductility with calcium alloys.



UNION CARBIDE METALS

Electromet *Brand Ferroalloys and other Metallurgical Products*

The terms "Electromet" and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

Circle 574 on Page 53

Republic Steel Provides Pig Iron
SERVICE IN DEPTH

UNIFORM CHEMISTRY HELPS PRODUCE HIGHEST QUALITY DIE SETS. The Producto Machine Company, Bridgeport, Connecticut, casts die set parts using only raw materials with a definite known analysis, including Republic Pig Irons. The year-in, year-out uniform chemistry of these fine irons helps Producto produce high quality, laboratory-controlled castings. The company has found that there is no better, no more economical means for insuring strong, flaw-free, easy-to-machine castings.

Pig iron *service in depth* is an exclusive Republic concept. It is designed to help you solve foundry production and metallurgical problems—designed to help you produce better castings most efficiently, economically, and profitably.

Here is how *service in depth* helps foundrymen everywhere.

First, Republic is the only producer of both Northern and Southern Irons. This means you can select the proper grade from the most complete line of merchant pig iron available in the industry. Northern grades include Chateaugay, Malleable, Bessemer, Foundry, and Basic. Southern furnaces produce Foundry and Basic.

Then, Republic provides expert metallurgical service to assist you in selection, application, and processing. Republic Pig Iron Metallurgists are frequent and welcome visitors in hundreds of foundries. They have at their fingertips information on the latest processes and techniques available for improving castings, and for expanding their use and sale. Their suggestions often result in improved operations, increased production efficiency, and in recapturing business lost to other methods of fabrication.

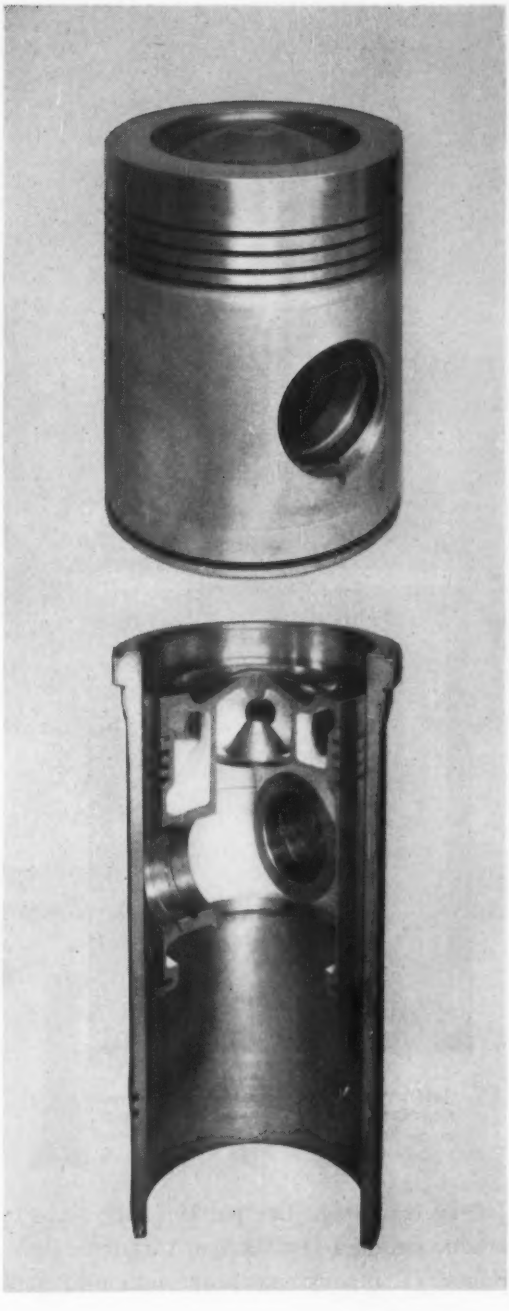
Service in depth is available now. Clip and mail the coupon for obligation-free metallurgical service, or for more information on Republic Pig Irons.

Here are three examples of pig iron *service in depth*.

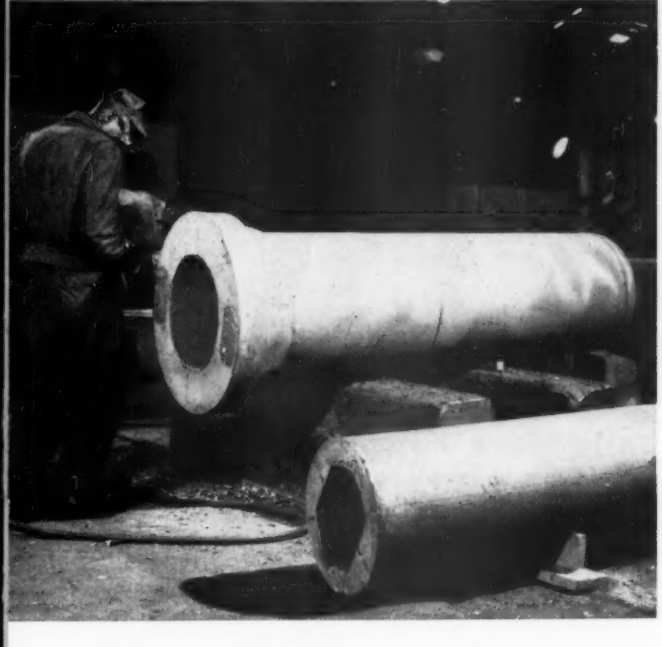
REPUBLIC

World's Widest Range of Standard Steels

CHATEAUGAY AGAIN PROVED IDEAL BASE METAL FOR DUCTILE IRON. Problem: Design a diesel engine piston with high mechanical strength, minimum weight, maximum wear- and heat-resistance, low ultimate cost. Using Chateaugay Pig Iron as the base metal, Hunt-Spiller Manufacturing Corporation, Boston, Massachusetts, successfully met all of these requirements in developing ductile iron diesel pistons as a replacement for aluminum. High total carbon and unusually low phosphorus, silicon, and manganese suit Chateaugay perfectly for ductile iron use. Inherently excellent physical properties are maintained in the ductile form assuring strong, flaw-free casting accurate to patterns and shapes.



METALLURGICAL SERVICE BENEFITS FOUNDRY'S CUSTOMER. On the advice of a Republic Pig Iron Metallurgist, Atlantic Foundry Company, Akron, Ohio, switched to Chateaugay Pig Iron for ram and cylinder castings used in hydraulic presses. The result: stronger castings, better machinability, higher wear-resistance, and a 21% saving to the customer. The value of Republic metallurgical service is pointed out in this statement by Atlantic's Vice President of Iron Foundry Operations. "When we have a foundry problem and put in a call for help, your metallurgical engineers are Johnny-on-the-spot, talking a language we can understand. Then it's not long before the problem is solved."



STEEL

and Steel Products

REPUBLIC STEEL

REPUBLIC STEEL CORPORATION
DEPT. FO-7842
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☐ Have a Pig Iron Metallurgist call.

Send more information on:
☐ Republic Pig Irons

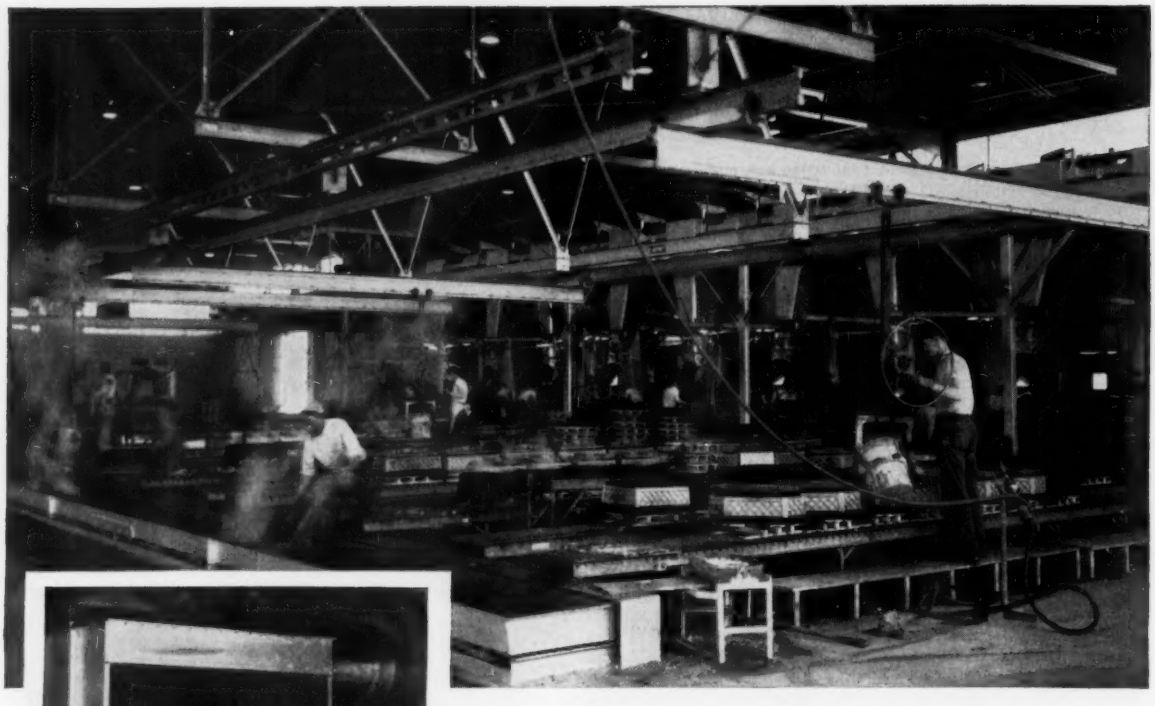
Name_____ Title_____

Company_____

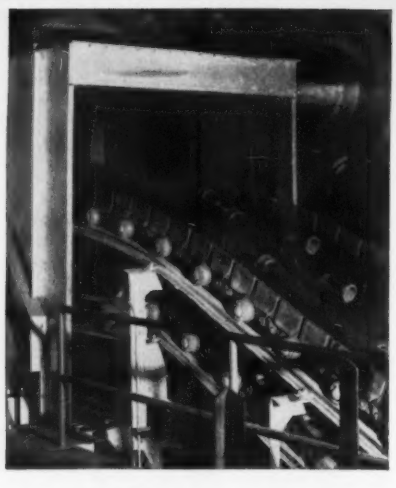
Address_____

City_____ Zone____ State_____

Circle 575 on Page 53



Machine-made fittings for cast iron soil pipe are made with a high degree of automation . . . via time-tested Jeffrey foundry equipment.



Jeffrey apron conveyors hustle new Charlotte-Spun® pipe from casting machine to cleaning and inspection facilities.

Charlotte Pipe meets challenge with

automatic pipe foundry

Jeffrey equipment has put soil pipe and fittings production on a fast track at Charlotte Pipe and Foundry Company's new multi-million dollar plant.

Production of cast iron soil pipe and fittings in this plant represents a major advance in foundry techniques. It involves a patented process using centrifugal force to distribute molten iron uniformly within metal molds lined with sand. Electronically-controlled machines produce smooth, seamless, easy-to-cut pipe.

Jeffrey-built sand conditioning equipment, belt conveyors, leakproof apron conveyors and bucket elevators are stepping up efficiency by mechanized movement of sand, pipe and fittings at this new North Carolina foundry.

Jeffrey engineering service will help make *your* foundry more productive, more profitable . . . with Jeffrey unit machines or a completely engineered foundry system. The Jeffrey Manufacturing Co., 907 North Fourth Street, Columbus 16, Ohio.

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CONVEYING • PROCESSING • MINING EQUIPMENT . . . TRANSMISSION MACHINERY . . . CONTRACT MANUFACTURING

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SILICA SANDS

Serviced by two main trunk railway systems, Ottawa offers fast delivery to all corners of the nation.

99.89%
PURE

Laboratory tests prove Ottawa Silica 99.89% pure.

Since 1900, our strategy has always been the same—to sell only the best. With a big assist from nature and through the most meticulous processing procedures, Ottawa silica products always add up the same way—the world's finest.

For a load of silica satisfaction, try Ottawa sands. All grades, unlimited reserves, excellent service.

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SILICA COMPANY
PLANTS LOCATED IN
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SERVING THE FOUNDRY, GLASS AND CERAMIC INDUSTRIES FOR OVER 50 YEARS

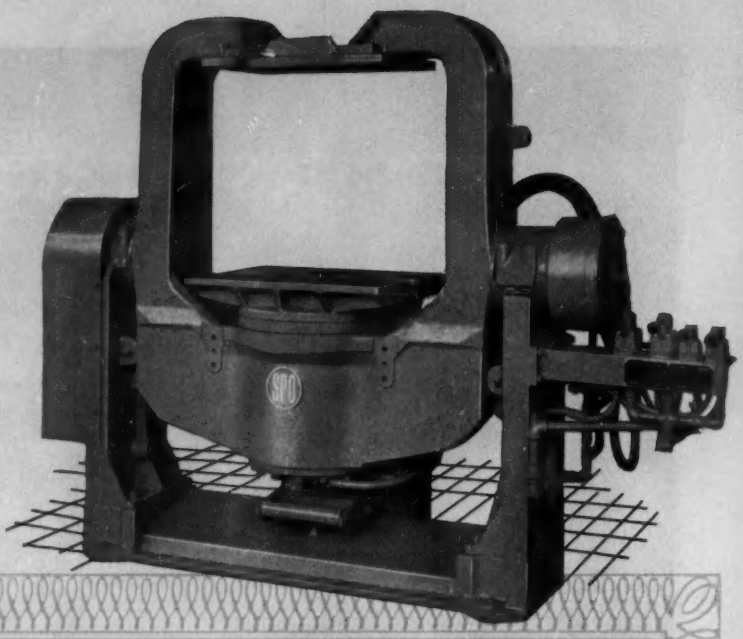
Circle 577 on Page 53

SPO's NEWEST, INDUSTRY's LARGEST

MODEL 9646

Jolt-Squeeze-Rollover DRAW MACHINE

With a 1500-lb. jolt capacity and 21,000-lb squeeze capacity on standard 80 p.s.i. line pressure, here is the LARGEST machine of this type in the foundry industry. Its super squeeze power features SPO's patented "inverted jolt" mechanism, delivers more thorough compaction of green sand for better molds, faster production, lower costs. Ruggedly built, it has a 12" pattern draw, power cylinder for smooth rollover action and a heavy-duty power brake that saves time and makes it easy for the operator to position the jolt table at intermediate points for flask loading.

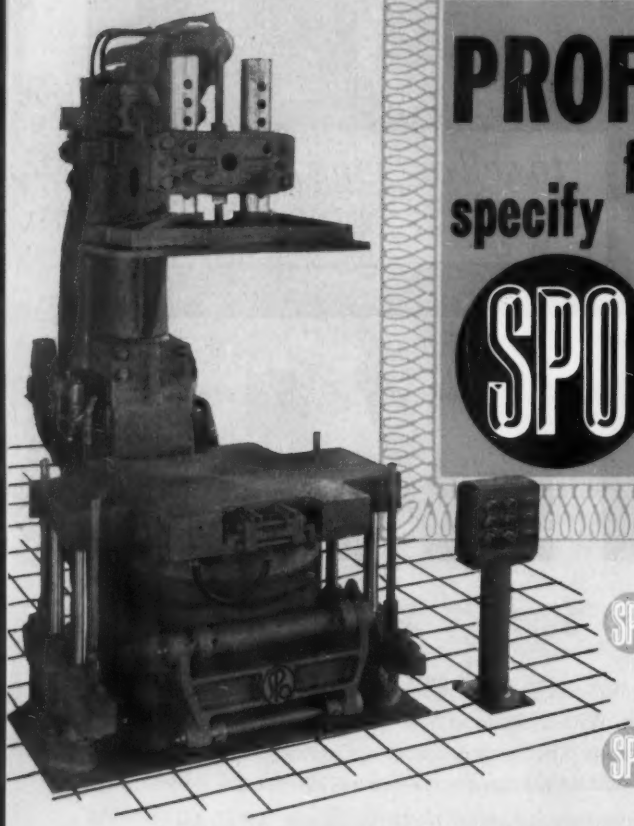


BE SURE TO GET THIS

PROFIT INSURANCE

for YOUR foundry

specify SPO COST-CUTTING MOLDING MACHINES



SPO means MORE production per day

Produce a wide variety of quality castings—in greater number per hour—with SPO automated machines engineered to produce better molds—fast, economically!

SPO helps you CUT costs

SPO automated machines (1) save time on EVERY operation, (2) are ruggedly built to cut down-time to a minimum, (3) improve casting quality by producing sound, uniform molds, (4) provide maximum safety and minimize operator fatigue, (5) increase your production without any increase in space. AA-9975

MODEL 2190

Jolt-Squeeze-Strip MOLDING MACHINE

Features SPO's patented "inverted jolt" mechanism that guarantees maximum operating efficiency and minimum maintenance. Has a 10" pattern draw, 12" squeeze stroke, 1500-lb. jolt capacity, and 22,000-lb. squeeze capacity on standard 80 p.s.i. line pressure. Pin centers: left to right, 27½ to 42"; front to back, 18 to 34".

WORLD'S LARGEST SUPPLIERS SPO OF MOLDING MACHINES

Wire or Write Today for Full Details

SPO INCORPORATED

6449 GRAND DIVISION AVENUE
CLEVELAND 25, OHIO, U. S. A.

Circle 578 on Page 53

Late News

FLYING HIGH: The American economy and the foundry industry have recovered from the recession which began late in 1957 and persisted through most of 1958. Soft spots still exist, and the steel strike may affect recovery adversely—but all indicators now point up.

Casting shipments during January and February totaled 2,586,392 tons, compared with 2,129,735 during the same 1958 months, an increase of more than 20 per cent. Furthermore, in 1958 production was falling, whereas now it's on the way up. Total 1959 shipments easily could reach the 16 million tons predicted in FOUNDRY's beginning-of-the-year survey (p. 101, February issue).

FREIGHT CAR ORDERS: One market for castings which has come to life dramatically is the railroads. During the first four months of 1958, the roads ordered only 1159 new freight cars. During the same period this year, however, they have placed orders for 20,344, or about 17½ times as many. This resurgence actually goes back to November of last year. Of the 17,546 new cars ordered during 1958, 10,125 went on the books in November and December. On May 1, this year, the backlog stood at 35,479 cars.

EQUIPMENT QUICKENS: Foundry equipment suppliers were bleeding badly a year ago, but in 1959 they're scrambling to make deliveries. The Foundry Equipment Manufacturers Association index, which uses the 1947-49 average as 100, averaged 67.1 during the first 1958 quarter and 177 during the same period this year.

Foundry Statistics

Iron and Steel Scrap Consumption

(Gross tons*)

	All Scrap Total	By Types of Furnace — Cupola Total	Air Total	Electric Total
1957				
Dec.	4,281,414	661,918	70,091	542,068
Total	65,688,592	9,220,405	1,026,951	8,876,400
1958				
Jan.	4,072,071	704,654	76,989	566,225
Feb.	3,491,441	611,394	64,971	466,657
Mar.	3,718,132	624,165	64,866	524,035
Apr.	3,429,121	599,427	61,839	631,220
May	3,862,491	596,253	59,060	553,756
June	4,409,006	615,271	62,703	605,733
July	3,716,739	543,726	47,203	513,394
Aug.	4,203,034	580,844	66,877	592,727
Sept.	4,472,219	680,660	71,198	637,400
Oct.	5,091,207	707,378	90,707	757,722
Nov.	4,803,615	700,704	74,382	691,078
Dec.	4,973,670	761,494	80,593	712,779
Total	50,242,746	7,725,970	821,388	7,152,726
1959				
Jan.	5,375,042	783,045	86,519	767,289

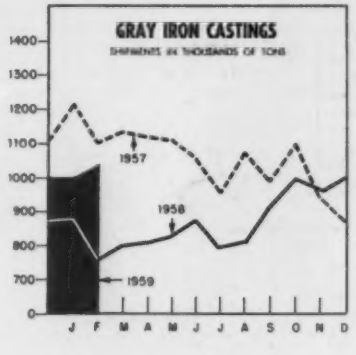
Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1958	1959
Jan.	57.9	127.4
Feb.	57.6	237.1
Mar.	85.9	166.6
Apr.	88.7	....
May	136.1	....
June	87.7	....
July	77.9	....
Aug.	74.1	....
Sept.	64.5	....
Oct.	118.9	....
Nov.	83.3	....
Dec.	137.9	....

Note: Base period 1947-49 taken as 100 per cent monthly average.

Source: Foundry Equipment Manufacturers Association.



GRAY IRON CASTINGS—SHIPMENTS

(Net tons[2])

	All Castings — Total	All Castings — For Sale	Miscellaneous Castings — Total	Miscellaneous Castings — For Sale	Nodular Iron Castings Total	Heavy Steel Ingot Molds Total	Chilled Railroad Car Wheels Total	Pressure Pipe & Fittings Total[3]	Soil Pipe & Fittings Total[3]	Unfilled Orders[2]
1957	12,664,504	6,876,497	7,786,229	3,310,915	.....	2,409,290	359,332	1,351,345	758,308	.....
1958										
Feb.	753,306	389,708	503,175	203,717	10,245	116,168	25,959	67,606	40,398	632,490
2 mo.	1,621,561	826,106	1,083,720	432,731	21,045	251,278	49,470	146,469	90,624	.....
Mar.	795,566	446,822	499,751	215,916	9,485	125,887	24,777	87,716	57,437	589,912
Apr.	806,720	457,498	483,999	210,344	8,015	121,489	25,401	112,292	63,539	582,446
May	820,054	472,192	469,026	203,025	5,671	134,312	23,498	123,017	70,201	570,293
June	867,948	541,904	503,252	245,651	5,773	135,477	22,928	129,671	76,620	572,706
July	791,560	465,650	430,882	185,275	3,999	157,478	19,928	110,790	72,481	580,155
Aug.	802,473	513,862	410,876	205,821	4,211	165,006	15,537	129,157	78,897	614,199
Sept.	916,704	537,717	518,185	227,414	4,622	175,323	20,783	125,693	76,720	644,834
Oct.	992,730	586,614	551,380	253,062	4,193	207,500	22,979	129,375	81,505	619,567
Nov.	958,306	505,290	575,586	231,669	3,426	201,704	18,801	98,326	63,889	602,375
Dec.	997,608	509,499	628,720	246,289	3,689	208,942	18,021	85,179	56,746	608,096
Total	10,371,232	5,883,154	6,155,377	2,657,197	74,129	1,884,396	265,134	1,277,685	788,479	.....
1959										
Jan.	1,001,771	517,390	625,604	250,161	4,103	214,985	27,550	75,571	58,056	687,245
Feb.	1,036,655	538,514	642,882	252,115	5,306	230,706	31,035	76,147	55,885	767,360
2 mo.	2,038,436	1,055,904	1,268,486	502,276	9,409	445,691	58,585	151,718	113,941	.....

*Source: U. S. Dept. of Interior, Bureau of Mines. [2]Source: Bureau of Census. [3]For sale only. [4]All cast iron pipe is shipped for sale.

Late News

A similar boom hit producers of industrial heating equipment during April, when new orders reached $13,328,000. That figure is higher than the $13,176,000 booked during the entire first four months of 1958. Total new orders for the first quarter of 1959 are up 95 per cent. As another indication of the trend, the Material Handling Institute's index, on which the 1954 average is 100, rose to 146.36 during March, the highest since September, 1956, except for one 1957 month.

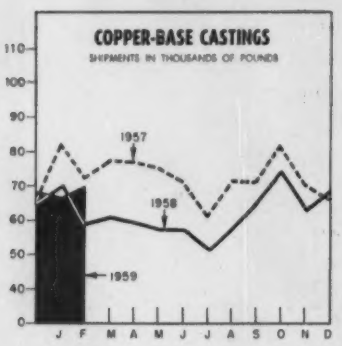
MEDALIST: Carl F. Joseph, technical director, Central Foundry Div., General Motors Corp., Saginaw, Mich., was awarded the McCrea Medal of the Malleable Founders' Society at the society's annual meeting at Hot Springs, Va., May 25.

EXPANSION: Arwood Precision Casting Corp. is engaged in an expansion and modernization program at its four plants. Capacity at Los Angeles has been increased 60 per cent, with an additional new building to be completed this summer. The Groton, Conn., plant capacity has been increased 50 per cent, and new equipment installations are being made at Tilton, N. H., and Brooklyn, N. Y. Rawson L. Wood, Arwood president, says that for the first time the trend of commercial bookings indicates that they will overtake government bookings.

FOUNDRY SALE: Stockholders of Pittsburgh Steel Foundry Corp., Glassport, Pa., meet May 29 to act on the proposed sale of their company to Textron Inc. for an indicated $5½ million. Other foundry operations controlled by Textron include Campbell, Wyant & Cannon Foundry Co., Waterbury Farrel Foundry & Machine Co., and Fanner Mfg. Co.

PERSONALS: Four executive appointments have been made at Central Foundry Div., General Motors Corp., following consolidation of the company's Fabricast plants with Central Foundry Div. George A. Zink continues as manager of Fabricast plants in Bedford, Ind., and Jones Mill, Ark., and also will serve as manager of light metals programs. Elmer E. Braun becomes divisional manager of ferrous metals operations. Carl A. Koerner has been appointed divisional director of sales and engi-

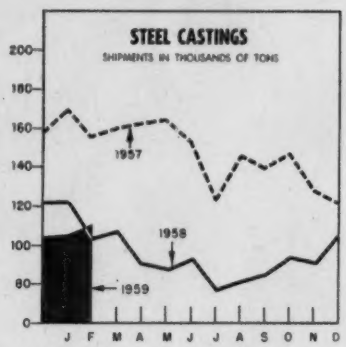
Foundry Statistics



COPPER-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments			Unfilled Orders[2]
	Total	Sand	Perm. Mold	
1957	874,627	789,014	44,789	.....
1958				
Feb.	58,356	52,579	3,202	27,243
2 mo.	128,063	115,873	6,529	.....
Mar.	60,157	54,007	3,395	25,434
Apr.	59,311	53,271	3,385	26,621
May	57,506	51,634	3,077	22,867
June	57,124	51,967	3,001	21,578
July	51,124	46,636	2,351	20,518
Aug.	57,790	52,981	2,425	24,851
Sept.	64,447	58,435	2,888	25,655
Oct.	74,012	67,564	3,239	26,726
Nov.	62,746	57,386	2,604	24,928
Dec.	67,905	61,119	3,535	25,078
Total	740,155	670,873	36,429	.....
1959				
Jan.	66,874	59,856	3,572	25,344
Feb.	69,589	62,593	3,557	25,377
2 mo.	136,463	122,449	6,829	.....



STEEL CASTINGS—SHIPMENTS

(Net tons[1])

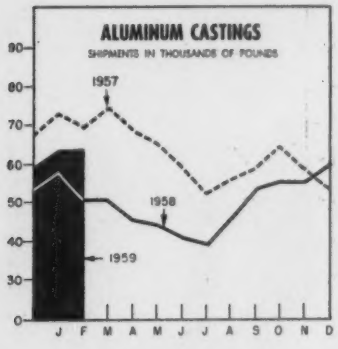
	All Castings			Carbon			Alloy			Unfilled Orders[2]
	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	Total	For Sale	Railway Specialties	
1957	1,766,191	1,359,747	349,059	1,328,478	1,019,090	324,951	437,713	340,657	24,108	.....
1958										
Feb.	103,297	79,708	16,647	74,283	56,781	15,273	29,014	22,927	1,374	282,358
2 mo.	224,019	174,425	39,192	161,808	124,984	36,388	62,211	49,441	2,804	.....
Mar.	106,233	82,195	16,180	77,564	60,208	15,240	28,669	21,987	940	252,840
Apr.	91,464	69,121	11,956	65,639	48,998	11,107	25,825	20,123	849	229,503
May	87,002	66,086	10,416	61,105	45,967	9,463	25,897	20,119	953	211,346
June	92,861	71,624	14,185	67,227	50,919	12,987	25,634	20,705	1,198	190,779
July	68,802	48,618	5,400	46,858	32,161	4,656	21,944	16,457	744	200,272
Aug.	80,886	59,816	8,021	57,539	42,069	7,090	23,347	17,447	931	196,300
Sept.	85,277	64,586	9,205	60,392	44,890	7,905	24,885	19,696	1,300	196,482
Oct.	96,389	73,367	12,254	67,906	51,065	10,980	27,483	22,302	1,274	184,925
Nov.	85,267	65,788	9,648	59,783	45,806	8,501	25,474	19,980	1,147	193,960
Dec.	103,800	81,360	13,187	76,015	59,171	11,934	27,785	22,189	1,253	214,352
Total	1,211,000	856,986	149,644	801,846	606,240	136,251	319,254	250,716	10,393	.....
1959										
Jan.	105,392	82,683	14,408	76,242	59,027	12,948	29,150	23,656	1,460	232,646
Feb.	110,280	86,013	14,686	79,365	61,261	13,316	30,645	24,752	1,370	245,096
2 mo.	215,672	168,696	29,094	155,607	120,288	26,264	59,795	48,408	2,830	.....

[1]Source: Bureau of Census. [2]For sale only.

neering. Edgar A. Wondracheck has been made plant manager at Bedford, with the Jones Mill plant reporting to him . . . James E. Martin has been appointed Cleveland district manager, Pangborn Corp., Hagerstown, Md., succeeding Robert E. Donnelly, retired . . . Samuel R. Parry has been named vice president-manufacturing, Combustion Engineering Inc., New York. He succeeds Robert M. Hatfield, who has become vice president and general sales manager in charge of domestic sales . . . John R. Crossgrove has been named specialist-marketing research, Foundry Dept., General Electric Co., Schenectady, N. Y. . . . Charles R. Muenger has become production plant manager, Dollin Corp., Irvington, N. J., diecasters . . . Frank Coolbaugh is new president of Climax Molybdenum Co., a division of American Metal Climax Inc. He succeeds Weston Thomas, elected executive vice president of the parent firm.

OBITUARY: J. M. Gallaher, 67, secretary-treasurer, Clearfield Machine Co., Clearfield, Pa., died May 14 . . . Earl H. Owen, 72, retired secretary, Owen Pattern Foundry & Mfg. Co., Norfolk, Va., died May 6 . . . Joseph C. Meyer, Snyder Foundry Supply Co., Los Angeles, died April 19 . . . John A. Lamont, former manager of the patent department, American Steel Foundries, Chicago, died May 10 . . . Henry N. Schramm, president, Schramm Inc., West Chester, Pa., died May 12 . . . Kingston F. Swallow, 49, board chairman, Motor Castings Co., West Allis, Wis., died May 15.

MISCELLANY: New elevated-temperature specifications for ferritic and pearlitic malleable irons are expected to be requested by the Malleable Founders' Society at the June meeting of the American Society for Testing Materials . . . Murray Mfg. Co., division of Tappan Stove Co., has started a $1½ million expansion program at its Murray, Ky., foundry . . . Manufacture of valve bodies this year will consume 20,000 tons of ductile iron and will reach 100,000 tons by 1961, predicts Donald J. Reese, International Nickel Co. . . . Chicago Foundrymen's Association and independent foundries in the Chicago area have agreed to a new two-year labor union contract calling for a 10-cent wage increase retroactive to May 4 and a 9-cent raise next May 1.



PRODUCTION WORKERS

Estimated Number

	Feb. 1959	Jan. 1959	Feb. 1958
Ferrous	184,100	180,500	177,400
Nonferrous	51,600	.....	.....

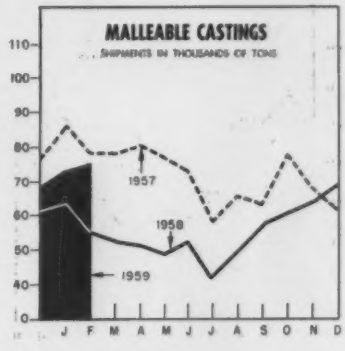
Average Weekly Earnings

Gray Iron	$92.98	$93.14	$78.94
Malleable Iron..	94.24	92.75	84.45
Steel	101.81	100.00	90.38
Nonferrous	97.44	98.16	89.24

Average Weekly Hours

Gray Iron	39.4	39.3	38.4
Malleable Iron..	40.1	39.3	37.7
Steel	40.4	40.0	37.5
Nonferrous	40.6	40.9	38.3

Source: Bureau of Labor Statistics.



ALUMINUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments				Unfilled Orders[2]
	Total	Sand	Perm. Mold	Die	
1957 .	751,818	143,991	232,326	373,586	.....
1958					
Feb. .	50,695	9,601	15,456	25,279	75,647
2 mo.	108,540	20,325	33,538	54,216	.....
Mar. .	50,547	9,311	15,255	25 918	63,600
Apr. .	44,948	9,531	13,369	21,956	60,317
May .	44,093	9,312	13,648	21,091	59,666
June .	40,701	8,644	13,679	18,292	63,670
July .	38,818	8,658	12,342	17,714	68,618
Aug. .	45,034	9,034	14,426	21,505	71,135
Sept. .	52,796	10,261	16,241	26,254	72,819
Oct. .	55,699	10,932	17,189	27,511	73,474
Nov. .	55,793	10,539	16,942	28 264	76,370
Dec. .	59,487	10,874	18,970	29,579	78,732
Total	596,456	117,421	195,599	292,300	.....
1959					
Jan. .	62,927	10,907	20,606	31,349	83,314
Feb. .	62,846	10,627	21,127	31,021	87,767
2 mo.	125,773	21,534	41,733	62,370	.....

[1]Source: Bureau of the Census. [2]For sale only.

MALLEABLE IRON CASTINGS

(Shipments of castings—net tons[1])

	Shipments		Standard		Pearlitic		Unfilled Orders[2]
	Total	For Sale	Total	For Sale	Total	For Sale	
1957	862,976	520,118	713,539	431,662	149,437	88,456	.....
1958							
Feb.	54,650	31,006	45,419	25,381	9,231	5,625	89,047
2 mo. .	117,384	65,926	96 850	53,597	20,525	12,029	.....
Mar.	51,708	29,624	43,368	24,333	8,340	5,291	84,330
Apr.	50 695	29,388	41,794	23,605	8,901	5,783	47,664
May	48,306	26,656	40,092	21,710	8,214	4,946	46,603
June	51,882	31,077	42.910	25 679	8,972	5,398	48,260
July	41,865	24,479	33.857	20.023	8,008	4,456	58,340
Aug.	49.252	29,414	41,734	24,696	7,518	4,718	55,145
Sept.	56,836	31,999	45.945	26 370	10.891	5,629	58,405
Oct.	60,981	40,014	50,181	31,992	10,800	8,022	63,425
Nov.	63,356	35,221	50.063	28 409	13.293	6,812	66,725
Dec.	65,385	40,041	53.797	32,883	14,588	7,158	66,725
Total ..	660,640	382,839	540,660	313,597	120,050	70,242	.....
1959							
Jan.	73,186	43,667	56,700	35,139	16.486	8,528	77,322
Feb.	74,760	42,093	57,573	31,976	17,187	10.117	90,291
2 mo. .	147,946	85,760	114,273	67,115	33,673	18,645	.....

Prices of Foundry Metals and Coke

(As of May 25, 1959)

FOUNDRY COKE

(Per net ton, f.o.b. ovens)

BEEHIVE

Connellsville	$18.00-18.50

OVEN

Birmingham	$30.35
Buffalo	32.00
Detroit	32.00
Erie, Pa.	32.00
Indianapolis	31.25
Kearny, N. J.	31.25
Milwaukee	32.00
Neville Island (Pittsburgh)	30.75
New England, deld.	33.55
New Haven, Conn.	31.00
Painesville, O.	32.00
Philadelphia	31.00
St. Louis	33.00
St. Paul	31.25
Swedeland, Pa.	31.00
Terre Haute, Ind.	31.25

PIG IRON

(Per gross ton, f.o.b. furnace)

	No. 2 Foundry	Malleable
Birdsboro, Pa.	$68.50	$69.00
Birmingham	62.50	66.50
Buffalo	66.50	67.00
Chester, Pa.	68.50	69.00
Chicago	66.50	66.50
Cleveland	66.50	66.50
Duluth	66.50	66.50
Erie, Pa.	66.50	66.50
Everett, Mass.	68.00	68.50
Fontana, Calif.	75.50	....
Geneva, Utah	66.50	....
Granite City, Ill.	68.40	68.90
Neville Island (Pittsburgh)	66.50	66.50
Swedeland, Pa.	68.50	69.00
Toledo, O.	66.50	66.50
Troy, N. Y.	68.50	69.00
Youngstown, O.	....	66.50

NONFERROUS INGOT

(Cents per pound, carlots)

BRASS AND BRONZE: Red brass, No. 115, 30.25; tin bronze, No. 225, 41.25; No. 245, 35.00; high-leaded tin bronze, No. 305, 34.50; No. 1 yellow, No. 405, 24.75; manganese bronze, No. 421, 27.75.

ALUMINUM: 99 per cent plus primary ingots 26.80. Secondary No. 12 alloy, 22.75-23.00. Deoxidizing grades: No. 1, 23.75; No. 4, 20.75.

MAGNESIUM: 99.8 per cent notched ingots 36.00, f.o.b. Velasco, Tex. (10,000 lb or more).

COPPER: Electrolytic 31.50, delivered Connecticut valley.

ZINC: High grade 12.00, delivered. Die casting alloy No. 3, 13.50; No. 2, 14.00, delivered.

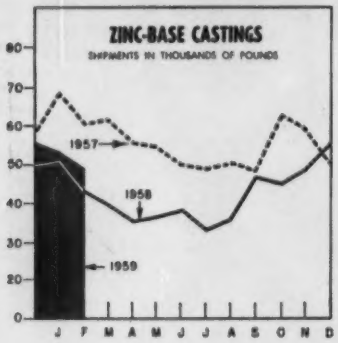
IRON AND STEEL SCRAP

(Consumer prices per gross ton delivered, except as otherwise noted)

	No. 1 Heavy Melting Steel	No. 1 Cupola Cast	Heavy Breakable Cast	Clean Auto Cast	Machinery Cast	Malleable	Short Steel Rails
Birmingham	$28.00-29.00	$53.00-54.00	.....	.....	.....	.....	.....
Boston*	**24.00	**33.00	.....	.....	**34.00	.....	.....
Buffalo	31.00-32.00	**44.00-45.00	.....	.....	**48.00-49.00	.....	49.00-50.00
Chicago	33.00-34.00	47.00-48.00	.....	54.00-55.00	54.00-55.00	57.00-58.00	52.00-54.00
Cincinnati*	**31.50-32.50	**43.00-45.00	**39.00-40.00	.....	**48.00-49.00	.....	**53.00-54.00
Cleveland	33.00-34.00	47.00-48.00	38.00-39.00	50.00-51.00	50.00-51.00	65.00-66.00	57.00-59.00
Detroit*	**28.00-29.00	**39.00-40.00	**31.00-32.00	**43.00-44.00	.....	.....	**43.00-44.00
Los Angeles	28.00	**47.00	.....	.....	.....	.....	.....
New York*	26.00-27.00	36.00-37.00	34.00-35.00	.....	.....	.....	.....
Philadelphia	33.00-34.00	41.00	42.00	.....	49.00-50.00	67.00-68.00	.....
Pittsburgh	34.00-35.00	45.00-46.00	.....	46.00-47.00	51.00-52.00	.....	54.00-56.00
St. Louis*	33.00	49.00	40.00	50.00	.....	.....	49.00
San Francisco	36.00	44.00	28.00	40.00	40.00	.....	.....
Seattle	33.00	34.00	28.00	.....	.....	.....	.....

*Brokers' buying prices. **F.o.b. shipping point

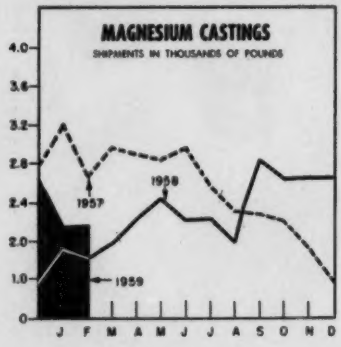
Foundry Statistics



PIG IRON

PRODUCTION*—Net Tons

	Foundry	Malleable & SBvery	Low & Int. Low Phos. & Bessemer
1957	2,275,789	3,697,335	7,452,203
1958			
Mar.	156,386	227,785	389,254
3 mo.	363,404	654,016	1,124,307
Apr.	136,180	173,139	424,954
May	127,438	165,045	396,009
June	121,869	167,192	342,617
July	123,075	156,582	402,850
Aug.	141,185	145,216	396 511
Sept.	133,556	234,752	416,026
Oct.	146,386	257,111	575,806
Nov.	175,210	257,131	459,095
Dec.	154,007	272,375	429,299
Total[1]	1,622,320	2,448,917	4,954,854
1959			
Jan.	190,392	263,105	479,019
Feb.	121,716	258,250	312,284
Mar.	173,881	341,218	412,533
3 mo.	485,989	862,573	1,203,836



ZINC-BASE CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957	669,775	431,509	.....
1958			
Feb.	42,687	27,482	50,676
2 mo.	93,258	57,850	.....
Mar.	39,719	26,782	43,366
Apr.	35,796	23,830	27,634
May	36,447	24,588	33,438
June	38,132	25,993	34,888
July	32,765	22,843	41,534
Aug.	35,860	26,971	45,066
Sept.	47,127	33,520	50,762
Oct.	45,045	36,103	58,154
Nov.	48,431	34,054	57,864
Dec.	55,600	39,768	56,756
Total	508,177	352,302	.....
1959			
Jan.	53,347	37,887	61,192
Feb.	48,779	34,147	61,163
2 mo.	102,126	72,034	.....

CONSUMPTION*—Gross Tons

	Cupola	Air	Electric
1957	4,160,891	218,178	246,851
1958			
Jan.	308 794	16,102	14.426
Feb.	260,940	14,014	7,740
Mar.	270.214	13,472	8,753
Apr.	262,007	13,975	9,585
May	256,204	12,001	11,764
June	262,883	12,098	15,549
July	239,140	10,550	12,140
Aug.	247,426	13,196	32,309
Sept.	300,173	14,994	27,759
Oct.	300,115	17,393	34,273
Nov.	287,013	14,862	31,397
Dec.	321,741	16,610	25,450
Total	3,314,652	169,267	231,145
1959			
Jan.	321,302	17,113	36,783

MAGNESIUM CASTINGS

(Shipments of castings—1000 pounds[1])

	Shipments—Total	Shipments—For Sale	Unfilled Orders[2]
1957	30,322	28,452	.....
1958			
Feb.	1,808	1,730	5,589
2 mo.	3,684	3,486	.....
Mar.	1,975	1,860	5,555
Apr.	2,215	2,141	5,555
May	2,422	2,196	5,200
June	2,205	1,996	5,515
July	2,200	2,063	6,706
Aug.	1,869	1,808	6,066
Sept.	2,804	2,581	6,063
Oct.	2,627	2,479	5,463
Nov.	2,615	2,523	4,063
Dec.	2,612	2,384	5,115
Total	27,228	25,517	.....
1959			
Jan.	2,151	2,044	5,001
Feb.	2,162	2,006	5,030
2 mo.	4,313	4,050	.....

*Source: U. S. Dept. of Interior. Bureau of Mines. **Source: American Iron & Steel Institute. [1]Source: Bureau of the Census. [2]For sale only. [3]Monthly figures do not add up to totals shown because of unreported monthly revisions.

Whitehead's FINE SILICA SANDS

for Fine Finish Castings and Shell Molding

Whitehead offers the widest variety of fine washed and unwashed silica sands . . . all laboratory-tested in a Whitehead laboratory in each of the areas represented.

DIVIDING CREEK, New Jersey
Fine Washed Silica Sands

Retained on Sieve #	Grade D #71	Grade D Special #75	Grade E #96	Grade Overflow #118	Grade Superior #158
30	none	none	none	none	none
40	2.0	1.0	1.0	.2	.2
50	9.8	4.8	7.6	3.2	1.8
70	26.4	14.0	20.4	13.2	4.6
100	41.0	40.2	31.8	29.0	11.2
140	15.0	29.8	17.2	20.2	22.4
200	4.4	8.2	10.8	15.4	25.6
270	.8	1.2	5.6	8.8	14.0
Pan	.6	.8	5.6	10.0	20.2

McCONNELLSVILLE, New York
Fine Unwashed Silica Sands

Retained on Sieve #	#103	#130	#155	#180	#230	#275
30	.3	.2	none	none	none	none
40	.5	.2	.4	"	"	"
50	4.2	.4	1.4	"	.2	"
70	13.6	1.6	3.2	.4	.2	.2
100	26.1	12.4	10.2	2.5	.4	.6
140	25.7	32.8	22.0	18.0	4.0	1.2
200	20.8	37.2	30.0	35.9	21.4	6.4
270	5.5	9.8	14.2	17.4	21.4	11.2
Pan	3.3	5.4	16.8	23.8	46.4	80.4
Very Fine	none	none	1.8	2.0	6.0	

NEW ENGLAND
Marion Fine Washed Silica Sand AFSF #105

Sieve #	Retained
+6	none
12	"
20	"
30	"
40	.6
50	1.4
70	6.0
100	30.6
140	34.4
200	19.2
270	4.6
Pan	3.2

BLANEY, SOUTH CAROLINA
Washed Silica Sands

	55 B (50 — 60)	65 B (60 — 70)	80 B (70 — 95)	140 B (130 — Plus)	120 B (110— 135)
30	3.6	.4			
40	14.0	3.8	1.0		.5
50	27.7	15.6	6.6	.2	3.4
70	28.7	29.4	21.0	1.4	11.2
100	18.1	28.6	32.8	8.0	20.4
140	6.8	16.2	27.0	24.6	25.8
200	1.0	4.2	8.4	28.4	18.2
270	.1	1.4	2.4	21.8	12.1
Pan		.4	.8	15.6	8.2
AFS	51	68	82	161	121

LEADER IN FOUNDRY SANDS SINCE 1841

Whitehead Brothers COMPANY

Established 1841

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324 West 23rd St., New York 11, N. Y.

NEW ENGLAND OFFICE
75 Westminster St., Providence 1, R. I.

Manufacturers of:

LYQUAGRIP
Ready-to-use core paste

DUO RESIN
Binder for baking with controlled oven temperatures

JOINT-SEAL
Plastic compound for perfect sealing

LYQUAFLOUR
For cleaner surface, better shakeout

LYQUAFACE
The liquid sand grain coating

Circle 579 on Page 53

Swim suit by Jantzen
$155 PER TON
"SEMI-STEEL"
SHOT and GRIT
top quality steel-type abrasives
IN 50 AND 100 LB. BAGS, PALLETIZED IF DESIRED

Good news! Now foundries can *really* cut steel abrasive cleaning costs — by discontinuing the use of high priced steel abrasives and changing to "SEMI-STEEL" shot and grit — saving $50 or more per ton before opening a bag!

"SEMI-STEEL" is not just low cost shot and grit. Rather, it's an entirely *new* type steel abrasive, produced by a *new* process so economically that it can be sold at this extremely low price. It does an excellent cleaning job — and does it faster than the best steel abrasive. Furthermore, "SEMI-STEEL" has proved easier on equipment than steel abrasives, so you save money on maintenance costs, too.

We're so confident that "SEMI-STEEL" will reduce your cleaning costs that we'll give you a *written guarantee* to that effect. Please order "SEMI-STEEL" on that basis at any time. Also, inquire about our free engineering service and laboratory tests — and ask about our lower prices on malleable and chilled abrasives.

METAL BLAST, INC.

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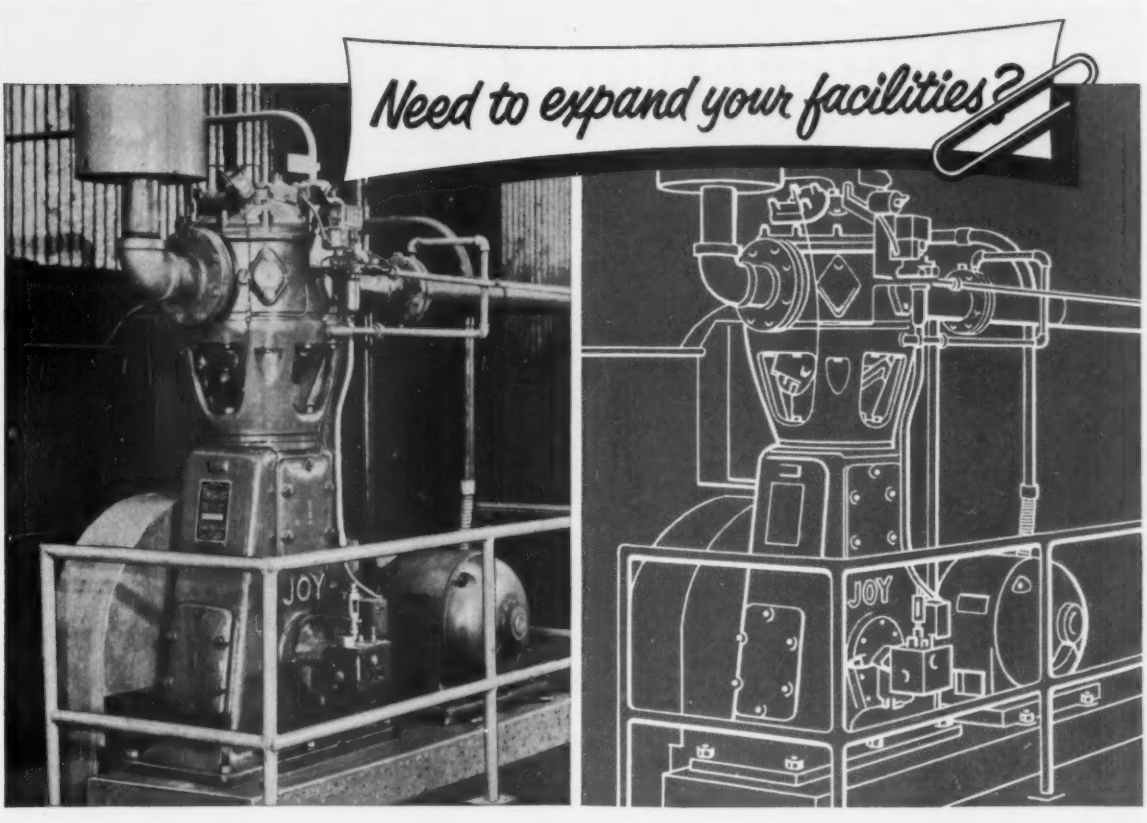


Add compressed air power efficiently with the JOY WG-9

The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7′1″ by 4′1″. This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

Thus, the WG-9 packs large compressor capacity in a small compressor area. It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

If you have plans for a small plant, the WG-9 is designed to give you continuous 24-hour heavy-duty service. It is also widely used to meet special requirements in larger operations, such as boosting air above standard plant pressures.

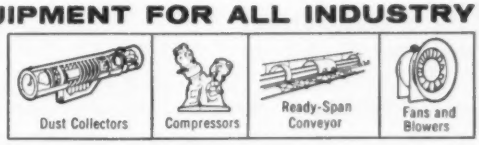
The Joy WG-9 is a water-cooled compressor, available in capacity ranges up to 881 CFM piston displacement and in pressures up to 150 psi. Standard drive is multiple V-belt. This machine can be furnished for flat belt or poly-V drive if desired.

LARGE COMPRESSOR FEATURES INCORPORATED IN ALL WG-9 COMPRESSORS

- Full Force Feed Lubrication
- Joy Patented "Dual-Cushion" Valves
- Anti-friction Main Bearings
- Replaceable Cylinder Liners and Crosshead Guides

Write today for bulletin 22-13.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



WAD I 5854-22

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

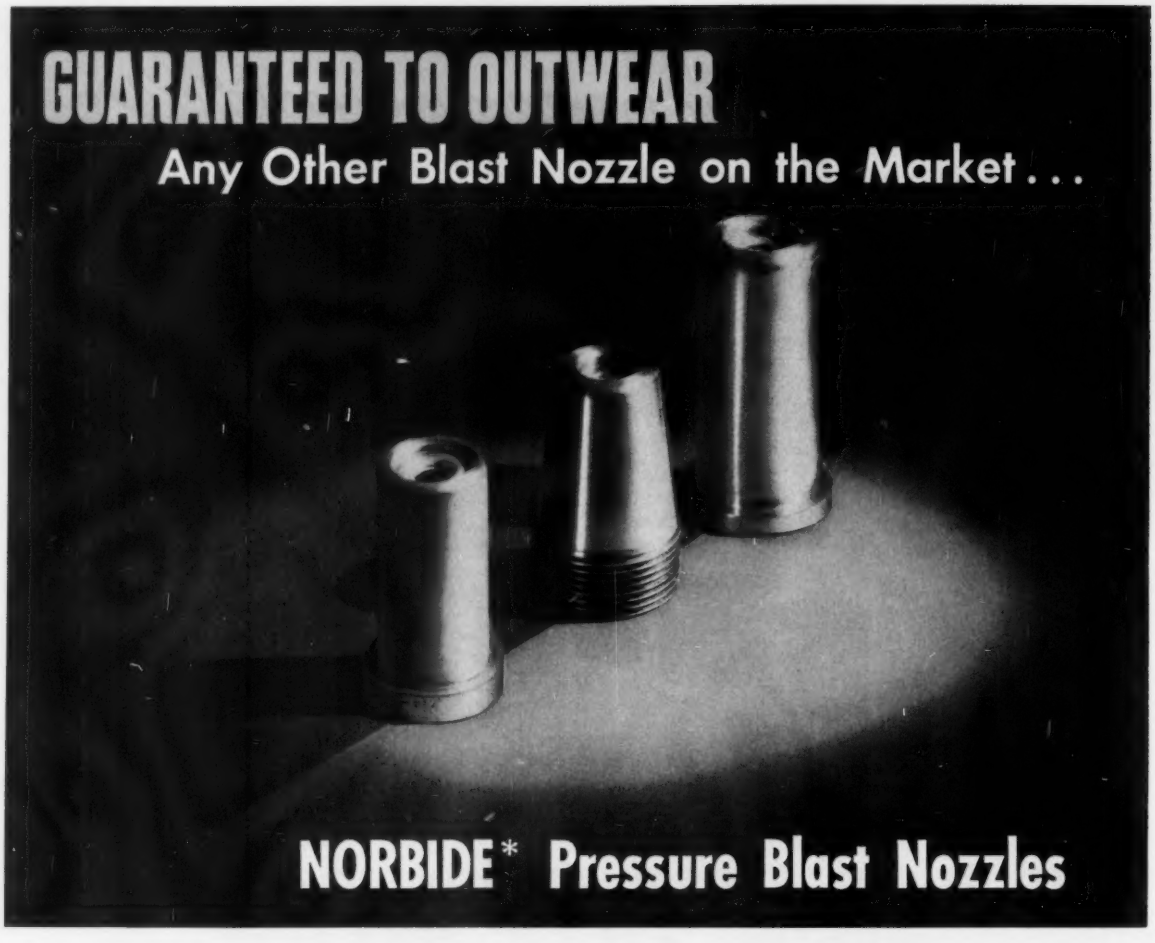
In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

←Circle 580 on Page 53.

Circle 581 on Page 53

GUARANTEED TO OUTWEAR

Any Other Blast Nozzle on the Market . . .



NORBIDE* Pressure Blast Nozzles

These popular Norton Nozzles — lined with boron carbide — the hardest molded material commercially available — are backed by this solid guarantee in effect for over 20 years:

750 Hours with silica sand
1500 Hours with steel shot or grit

Before you buy nozzles, compare the facts. Weigh this solid guarantee against others, then try NORBIDE Boron Carbide Nozzles. You'll find they outwear other nozzles by hundreds of hours.

Here's Why We Can Make This Guarantee:

Actual Comparative Hardness — Nozzle Materials — Knoop Scale	
Ordinary cast iron	150-200
Cemented tungsten carbide	1400-1800
Bonded Al_2O_3 (Alumina ceramic)	2000
NORBIDE Boron Carbide	2800

For full details on cost-cutting NORBIDE Nozzles — write for folder Form 543.

*Trade Mark Reg. U. S. Pat. Off.

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307 New Bond Street
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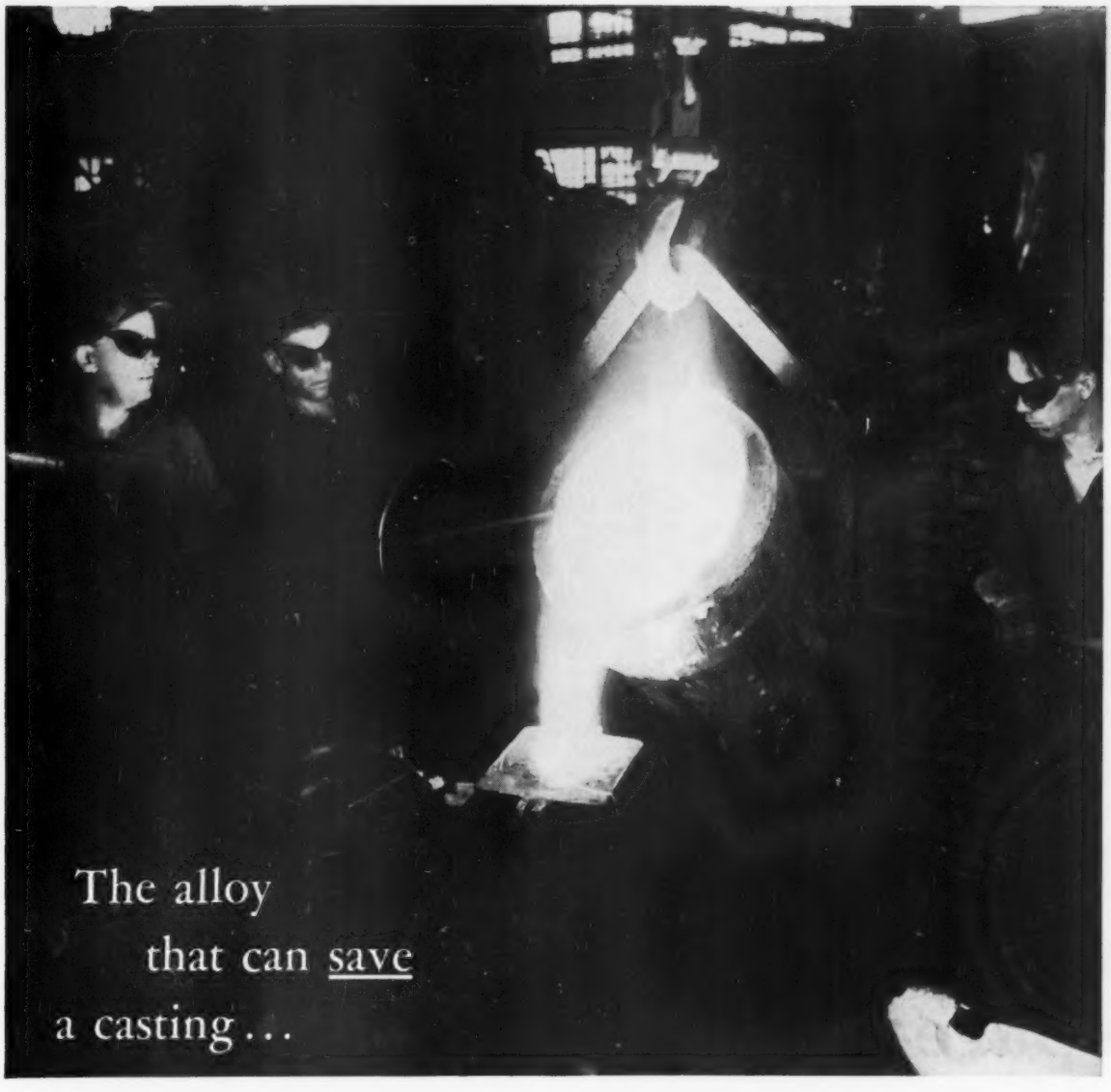
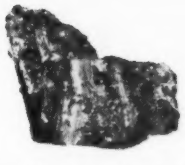
BORON CARBIDE

Making better products . . . to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — BEHR-MANNING DIVISION • Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes





...Vancoram Ferrovanadium! A small amount of ferrovanadium gives castings extra strength and extra durability. It is one of the most powerful carbide-forming agents you can use—castings resist structural changes even at high temperatures. Ferrovanadium restrains graphitization, too. Graphite flakes are small and uniform in size, thus improving the tensile strength of the metal. Now what about the economics of vanadium? Because you use so *little* to do so *much*, Vancoram Ferrovanadium is far more economical to use than you may realize. And it's plentiful! For more facts about this useful alloy, write us or call any distributor of VCA foundry products. Vanadium Corporation of America, 420 Lexington Avenue, New York 17, N. Y. • Chicago • Cleveland • Detroit • Pittsburgh

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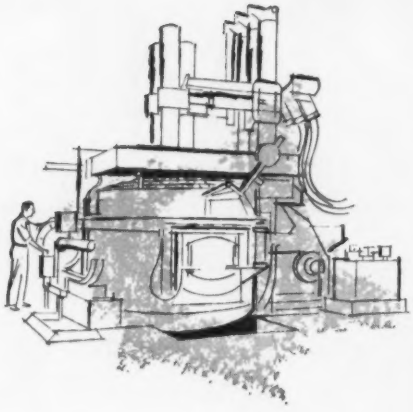
Producers of alloys, metals and chemicals

VANADIUM CORPORATION OF AMERICA

Circle 583 on Page 53



Lectromelt ships 77% of furnace spare-part orders from stock

When you need replacement parts on a Lectromelt electric furnace, you'll find we are as interested in speed as you. Therefore, we've set up a separate service department to handle sales, check orders against original blueprints to insure accuracy, and maintain a complete spare parts inventory.

Routine orders are in and out in a few days; rush orders in a few hours. A very large stock is maintained so that *over 77% of current orders* are filled right off the shelf.

Lectromelt service is geared to help you operate efficiently for years to come. Thus, if you're planning new capacity, you'll find it wise to contact Lectromelt now. Lectromelt Furnace Division, McGraw-Edison Company, 314 32nd Street, Pittsburgh 30, Pennsylvania.

FOR THE MOST EFFICIENT MELTING Lectromelt® McGRAW EDISON

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IT'S THEIR JOB

Because foundry practices differ greatly, a core or mold-making product perfectly suited to one foundry operation may not be nearly as effective in another.

Knowing these differences, Thiem laboratory technicians literally custom-fit products to a foundry's operation. The result is core and mold-making products that cut costs — speed operations — improve casting surfaces.

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THIEM PRODUCTS INC.

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Manufacturers of foundry products exclusively

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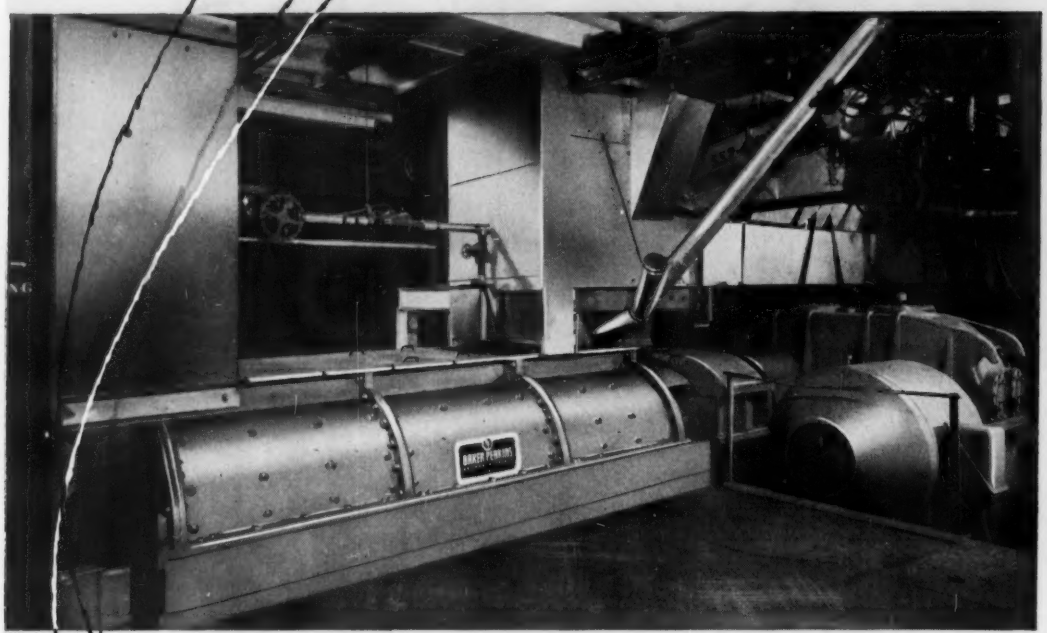
NOW . . .
a single B-P Continuous Muller handles 300 tons of sand per hour



The new Baker Perkins Size 8 Muller, now in successful operation in one of the midwest's automotive foundries, has 300% more hourly capacity than any available batch type muller and 100% more capacity than the next size B-P continuous unit. As with all B-P Continuous Mullers, cleaner, smoother castings are obtained with fewer rejects because molding sands are thoroughly mixed and tempered. The special Sigma-type agitators assure that each grain of sand is coated with the correct proportion of bond.

Baker Perkins builds Continuous Mullers in capacities from 30 to 300 tons per hour. Because of their rigid, rugged construction, B-P Continuous Mullers give many years of service. Installations in many of America's largest foundries have proven the efficiency of Baker Perkins Continuous Mullers under the most exacting conditions.

For further information about B-P Continuous Foundry Sand Mullers and B-P Unidor mixers for core and special process sand mixing, send for catalog No. F-156.

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BAKER PERKINS INC.

FOUNDRY MACHINERY DIVISION • SAGINAW, MICHIGAN

View through door of a press forge furnace showing B&W Insulating Firebrick walls and arches and B&W 80 Firebrick floor. The burners and flues are visible on the back wall.

B&W Insulating Firebrick reduce fuel costs 15% and increase production

Experience paid off for this major steel producer. Aware of the benefits of B&W Insulating Firebrick in his drop forge furnaces, he built two new press forge furnaces with lightweight B&W IFB linings. The results were a minimum average fuel saving of 15% *and* increased production, since the entire heating process for certain grades of steel could now be accomplished in one operation. Here's why.

The lightweight and consequent low heat storage of B&W IFB linings keep the furnace walls at a uniform temperature to provide the most efficient heating conditions. Unlike heavier constructions, B&W Insulating Firebrick linings attain a uniform temperature faster with less fuel consumption.

In addition, B&W IFB linings respond quicker to temperature changes, permitting more accurate temperature control. In this instance, this not only prevented the cracking of tool and stainless steels, but helped reduce the total heating cycle, increasing production.

These forging furnaces use a 9" B&W K-30 IFB wall backed up by B&W K-20 IFB. The K-30 is used as face brick because of its high temperature resistance. The K-20 is used as a backing because of its high insulating value. The hearth floor is of B&W 80 Firebrick for abrasion resistance and resistance against attack by millscale at the temperatures involved. Door linings are of B&W Kaocast and B&W Kaolite.

B&W REFRACTORIES PRODUCTS: B&W Allmul Firebrick • B&W 80 Firebrick • B&W Junior Firebrick • B&W Insulating Firebrick • B&W Refractory Castables, Plastics, and Mortars • B&W Silicon Carbide • B&W Ramming Mixes

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
REFRACTORIES DIVISION
GENERAL OFFICES: 161 EAST 42nd ST., NEW YORK 17, N.Y.
WORKS: AUGUSTA, GA.

Circle 587 on Page 53

How Milt Ekberg tripled cutting

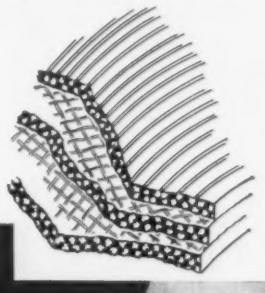
Milt Ekberg is Executive V. P. of Bay State distributor Johnson deVou, Inc., Springfield-Worcester, Mass. Twenty-five years as an abrasive engineer have given him experience that is as deep as it is wide and varied.

speed safely at Chapman Valve

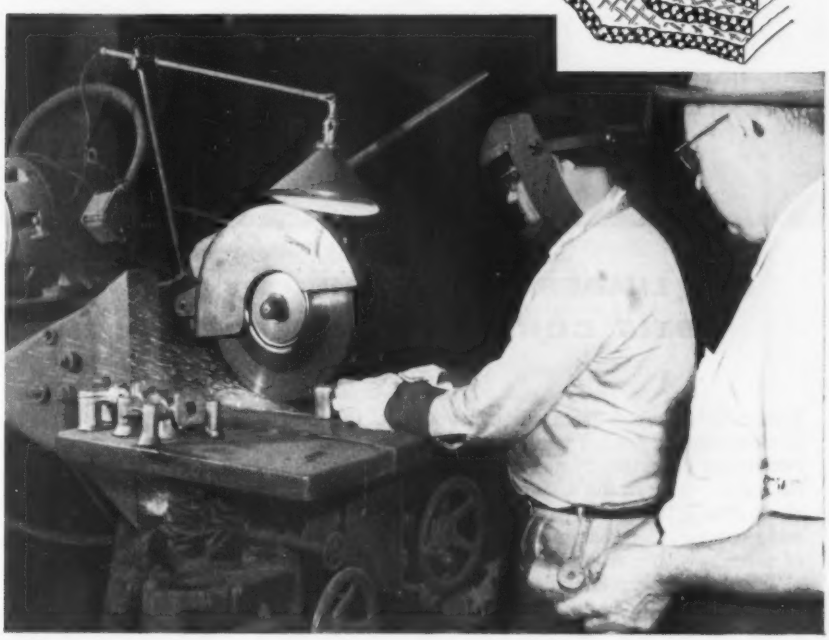
There were two big disadvantages in the old-time method of torch-cutting gates and risers off valve-body castings: A separate grinding job was required to finish off the cuts smoothly . . . and the torch-cutting method was slow and tricky. But safety engineers at The Chapman Valve Manufacturing Company, Indian Orchard, Mass., wouldn't approve using an abrasive cut-off wheel because of the danger that the wheel might shatter and injure operators.

They wouldn't approve, that is, until Milt Ekberg came up with Bay State's now famous BZ2AA reinforced cut-off wheel. Exhaustive tests of wheels supplied by all leading manufacturers proved that the BZ2AA was not only the safest but far and away the fastest, too . . . *three times* as fast, in fact, as torch-cutting. Long wheel life added further to the economies effected by the BZ2AA.

Like Milt Ekberg, your own Bay State distributor is a trained abrasive specialist. He may well have a simple, cost-cutting solution to some problem that seems insoluble simply because you're too close to it. In any case, he's a man who is well worth knowing because . . . *better grinding at lower cost, that is his business.*



Cut-away section of BZ2AA wheel shows reinforcement between layers of bonded abrasive. Improved Bay State bond formulation and bonding technique result in accurate control and close matching of wear rates of all three major components of wheel . . . bond, reinforcement and abrasive.



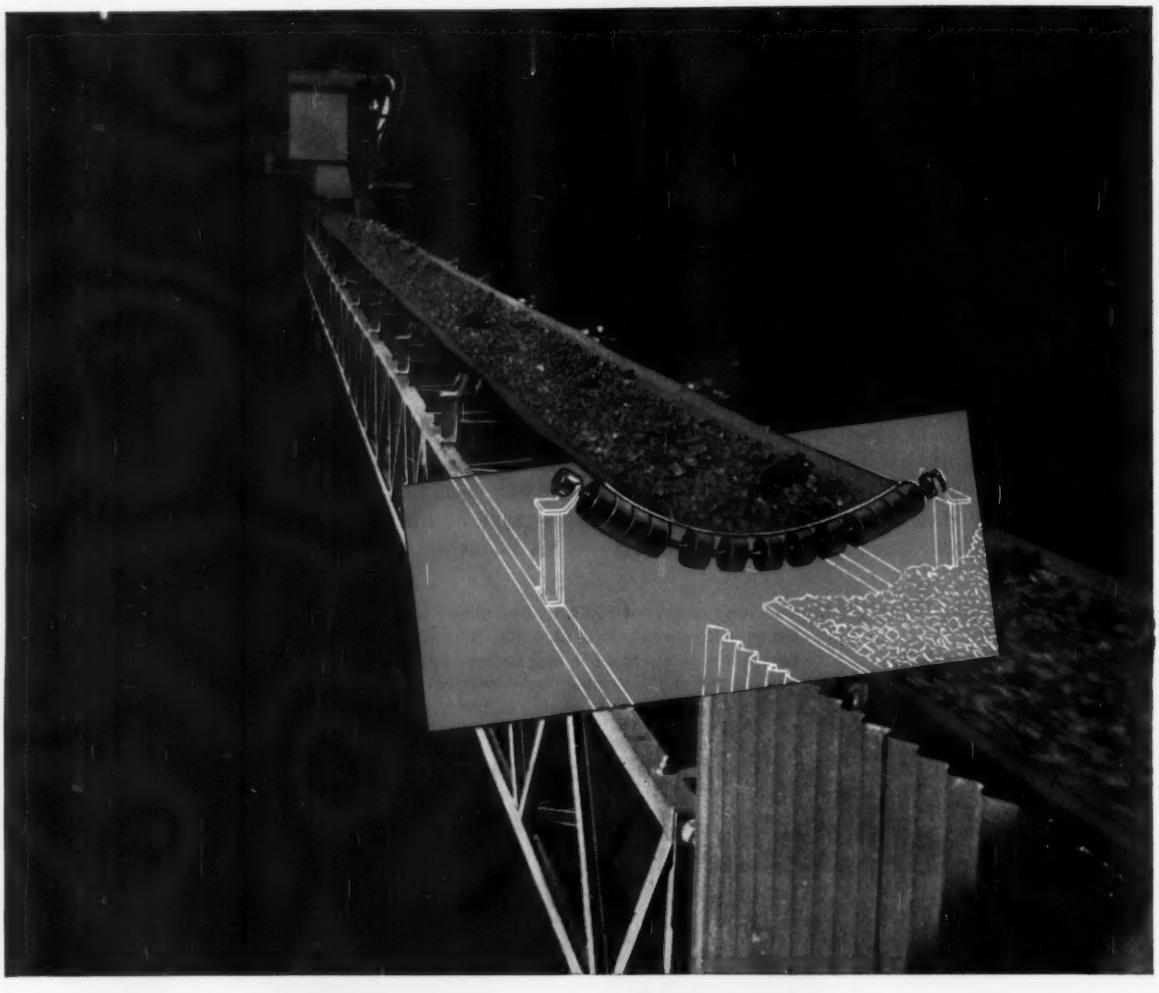
Steel foundry foreman Leo Labossiere, with 30 years foundry experience, watches operator Teddy Crepeau remove gates and risers, grind smooth finish in one swift and uncomplicated operation using BZ2AA reinforced cut-off wheel.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

Circle 588 on Page 53



JOY LIMBEROLLER . . THE *easy going* BELT CONVEYOR IDLER WITH PLENTY OF BACKBONE

Radically different from all other idlers, the Joy Limberoller is a flexible steel cable suspended between two sealed bearings . . . neoprene discs are molded to the cable . . . forming a single roll idler which turns on its own axis. This imparts a flexing action which is self-cleaning . . . prevents material build-up, a source of trouble with conventional idlers.

The Joy Limberoller idler supports the belt across its entire width in a true catenary . . . doesn't bend or pinch the belt between steel rolls like conventional idlers. Hard materials don't "bump along" from idler to idler, either. Belt life is increased 20% and more.

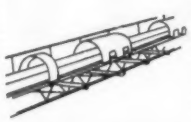
Abrasive or corrosive materials are no problem, because only two bearings are used. They are up out of the dirt zone, not hiding down under the belt where inspection and maintenance are difficult. Joy Manufacturing Company has never replaced a single bearing due to normal failure. Heard enough? Get the whole story from:

Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited: Galt, Ontario.

WBW L7373-269

WRITE FOR BULLETIN 269-13

INDUSTRIAL COMPRESSORS



CONVEYORS

ELECTRICAL CONNECTORS

FANS AND BLOWERS

JOY

SINCE 1851 . . . OVER 100 YEARS OF ENGINEERING LEADERSHIP

Circle 589 on Page 53

A 3M Case History Report

GRINDING PRODUCTION INCREASED 50% WITH "WETORDRY" BELTS

MANUFACTURER: Dictaphone Corporation

ADDRESS: Bridgeport, Conn.

PRODUCTS MANUFACTURED: Dictating Equipment

3M ABRASIVE USED: "WETORDRY" Tri-M-ite Cloth Belts

HOW 3M ABRASIVES ARE USED: Sizing bottom side of cast magnesium main frame of Dictaphone dictating machine, to remove burrs and casting imperfections for true flatness.

OPERATIONAL DATA ON 3M METHOD: Grit 60 "Wetordry Tri-M-ite" Cloth Belt is used on an Engleberg Huller BG8 Grinder. Constant flow of water is maintained over grind surface of the magnesium.

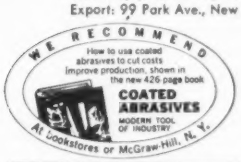
OPERATIONAL DATA ON PREVIOUS METHOD: A competitive brand of abrasive belt was used for the same operation.

PROVEN ADVANTAGES OF 3M METHOD: Production increased 50% per belt—from 900 pieces with the former belt to 1,350 pieces per 3M Belt with no loss in time or decrease in quality.

OTHER 3M ABRASIVE PRODUCTS NOW IN USE: "Three-M-ite Resinite" Cloth Belts are used to finish aluminum trim bands; "Tri-M-ite" Cloth "PG" Wheel used to pre-polish dictating belt mandrel ends.

WANT MORE INFORMATION? Send for free manual, "3M Method of Belt Grinding and Finishing." Just write on your letterhead to 3M Co., St. Paul 6, Minn., Dept. CN-69.

"Wetordry", "Tri-M-ite", "Resinite", and "Three-M-ite" are registered trademarks of 3M Co., St. Paul 6, Minn.
Export: 99 Park Ave., New York. Canada: London, Ontario


WE RECOMMEND
How to use coated abrasives to cut costs improve production, shown in the new 426 page book
COATED ABRASIVES
MODERN TOOL OF INDUSTRY
At bookstores or McGraw-Hill, N. Y.

3M Coated Abrasives

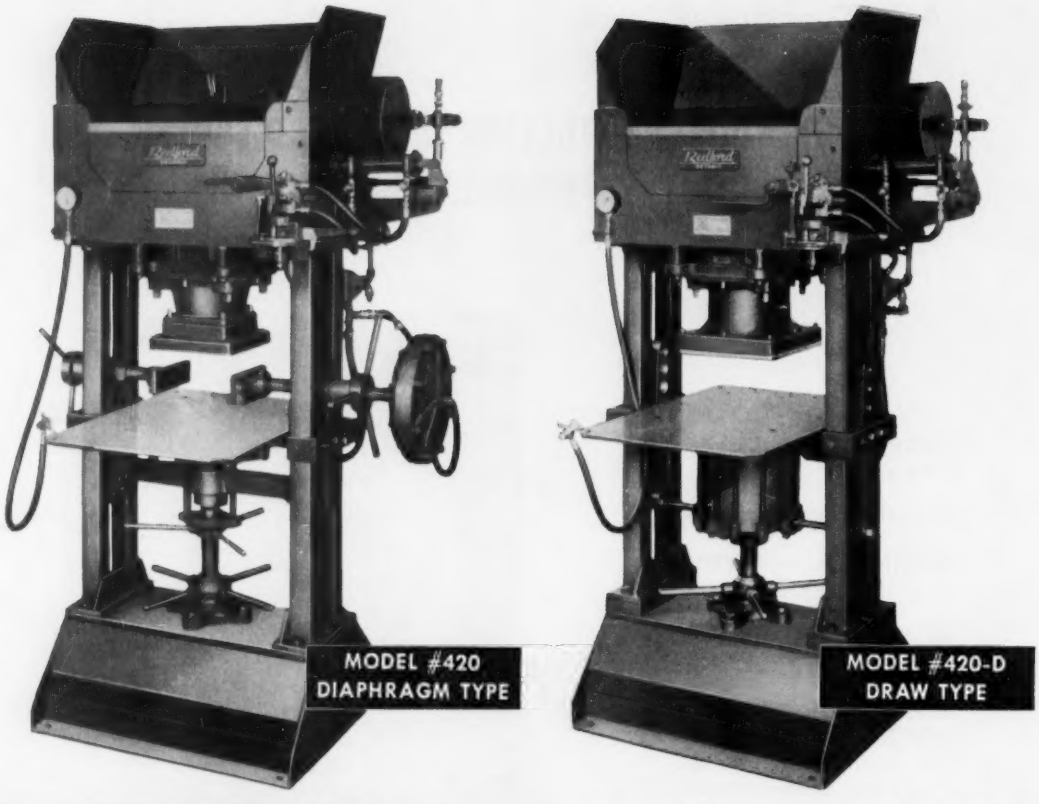
"WETORDRY" CLOTH BELTS

MINNESOTA MINING AND MANUFACTURING COMPANY

...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

Circle 590 on Page 53



Redford CORE BLOWER AND CORE SHOOTER

Here is a core making machine that is setting new standards in versatility and performance. The #420 Redford is equipped *to make cores up to 20 lbs. using any type binder*. Proven core blowing practices may be continued to do the most intricate work and to assure maximum production. Tough sand mixes which do not readily lend themselves to blowing can be used in ramming or shooting cores.

Core shooting requires a fast acting machine having sufficient capacity to propel sand at high velocity through a large shoot head opening. The large shoot head opening offers little resistance to the flow of sand and allows any sand to be rammed into suitable open cavity core boxes ahead of the propelling air.

With the #420 Redford we offer a tool that allows you the widest choice of application. It is a properly balanced combination of standard Redford practices that makes possible a low cost machine of greater usefulness and versatility to meet today's core room requirements.

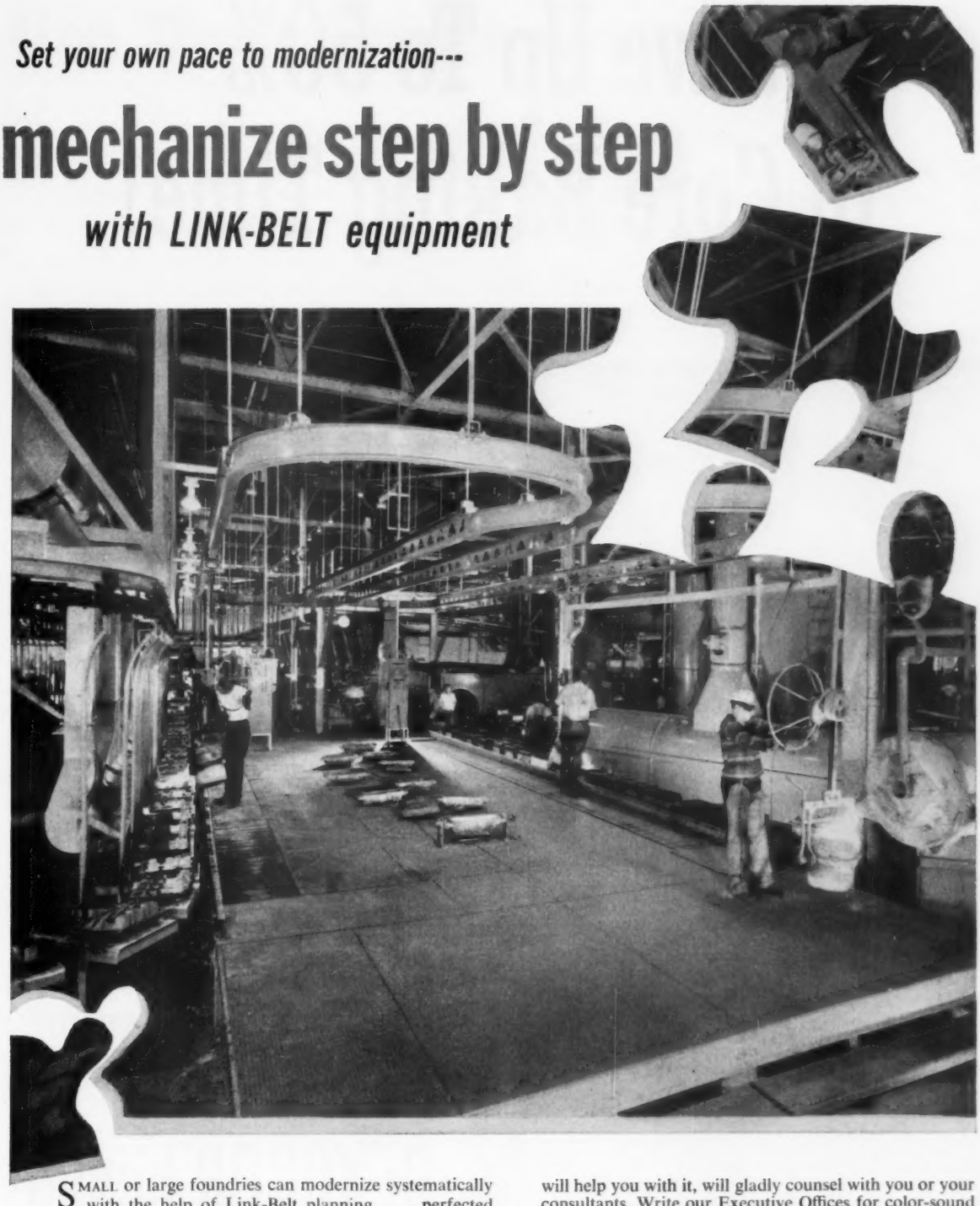
Redford IRON & EQUIPMENT CO.
20733 Glendale • Detroit 23, Michigan
Phone: KEnwood 1-8611

For Complete Information write for
BULLETIN #42

Set your own pace to modernization---

mechanize step by step

with LINK-BELT equipment



SMALL or large foundries can modernize systematically with the help of Link-Belt planning . . . perfected through 50 years of serving foundries. Industry's broadest line of conveyors and preparation machinery allows you to add equipment where it's needed most . . . *piece by piece at your own pace.*

Start anywhere! Whether it's the handling of sand, cores, molds, castings . . . or a complete system—Link-Belt will furnish and install equipment that results in lower costs, more efficient operation, better working conditions.

For best results, step-by-step mechanization requires a sound, long-range program. Our foundry specialists will help you with it, will gladly counsel with you or your consultants. Write our Executive Offices for color-sound film, "Foundry Flexibility," showing the benefits of mechanization. It will be lent on request.

LINK-BELT

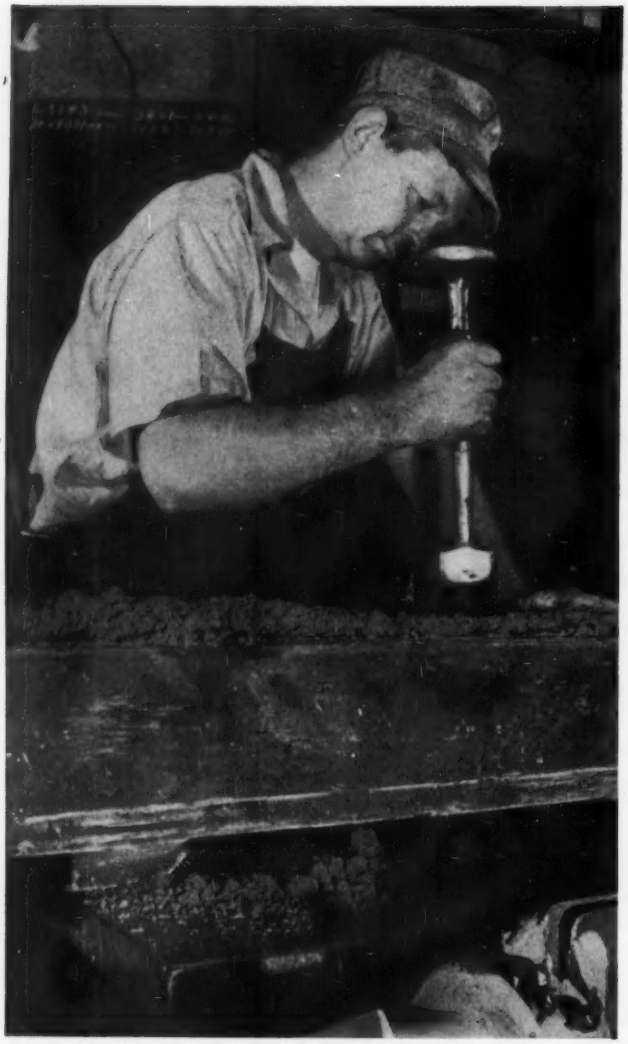
CONVEYORS AND PREPARATION MACHINERY

MEMBER FEMA

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15.014

Circle 592 on Page 53

Save Up To 50% In Core Baking Time!



Dexocor yields top results with all ramming processes.

Use Dexocor binder, the amazing new binder for sand molds. Field reports show this *dry* replacement for core oil cuts baking time 30 to 50 percent!*

Savings of fuel dollars and more flexible production scheduling are only two of Dexocor's advantages. Among its other features are: faster mulling... low gas generation... excellent green strength ...high baked strength...uniform density ...easy shake-out...ready collapsibility.

Whether you make small or large castings, simple or intricate, you will profit by the properties of Dexocor. One foundry now uses it in 19 different sand and core mixes!

For the full facts on this amazing new binder and technical assistance in adapting it to your special needs, contact our nearest sales office or write direct.

*Source on request

DEXOCOR® binder

DEXOCOR® is the perfect teammate for MOGUL® and KORDEK® binders and GLOBE® dextrines

CORN PRODUCTS SALES COMPANY 17 BATTERY PLACE, NEW YORK 4, N.Y.

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- For further data on products described in the Equipment and Supplies section (Page 105)
- To get copies of publications listed in the Literature for Foundrymen section (Page 138)
- To request extra copies of editorial articles

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401	431	461	491	521	551	581	611	641	671	701	731	761	791	821	851
402	432	462	492	522	552	582	612	642	672	702	732	762	792	822	852
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426	456	486	516	546	576	606	636	666	696	726	756	786	816	846	876
427	457	487	517	547	577	607	637	667	697	727	757	787	817	847	877
428	458	488	518	548	578	608	638	668	698	728	758	788	818	848	878
429	459	489	519	549	579	609	639	669	699	729	759	789	819	849	879
430	460	490	520	550	580	610	640	670	700	730	760	790	820	850	880

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405 435 465 495 525 555 585 615 645 675 705 735 765 795 825 855
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410 440 470 500 530 560 590 620 650 680 710 740 770 800 830 860
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418 448 478 508 538 568 598 628 658 688 718 748 778 808 838 868
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425 455 485 515 545 575 605 635 665 695 725 755 785 815 845 875
426 456 486 516 546 576 606 636 666 696 726 756 786 816 846 876
427 457 487 517 547 577 607 637 667 697 727 757 787 817 847 877
428 458 488 518 548 578 608 638 668 698 728 758 788 818 848 878
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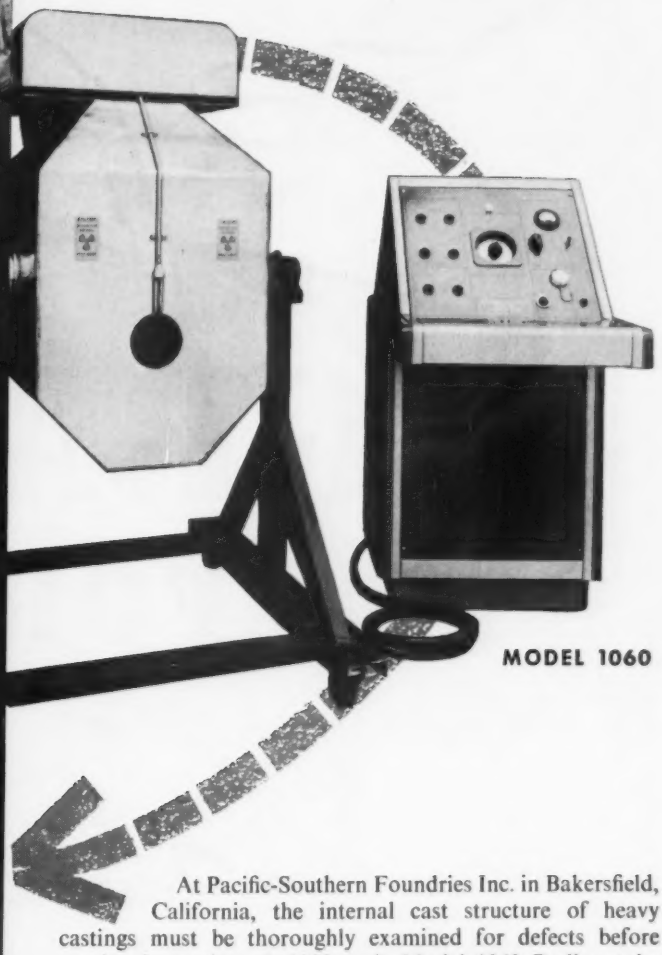
COMPLETING THE PICTURE . . .

Nuclear Systems Economical, Portable Radiography Machines



MODEL 1060

At Pacific-Southern Foundries Inc. in Bakersfield, California, the internal cast structure of heavy castings must be thoroughly examined for defects before passing inspection. A 1000 curie Model 1060 Radiography Machine from Nuclear Systems does the job in minimum time with the powerful radiation from Cobalt 60 . . . at a real saving over conventional x-ray methods, which cost 3 to 4 times more.

Like Pacific-Southern, foundries and fabricators all over the country are saving time and money . . . keeping quality high . . . with Nuclear Systems safe, portable, economical radiography machines.

If you have an inspection problem, Nuclear Systems has a unit to meet your needs. For full information, contact Dept. F-6 at one of our sales offices. Also . . . inquire about Nuclear Systems regularly scheduled three-day Radiation Health Physics Course—an approved AEC licensing aid.

PHILADELPHIA • CHICAGO • SAN FRANCISCO

NUCLEAR SYSTEMS

A DIVISION OF THE BUDD COMPANY, Philadelphia 32, Pa.

Budd

Circle 594 on Page 53

Famous

CORNELL CUPOLA FLUX

for CLEANER IRON

for Gray Iron and Malleable Foundries

don't accept substitutes

If you melt aluminum, copper or brass, try Famous Cornell Aluminum, Copper or Brass Flux. Write for Bulletin 46-A.

The CLEVELAND FLUX Company

1026-40 MAIN AVENUE, N.W. • CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES

Trade Mark Registered

THE SMITH TURBINE-TYPE MIXER

Ideal for:

- Coating shell-process sands
- Mixing CO_2-process sands
- Rebonding and reviving heap sands for green-sand molding
- Mixing oil-bonded core sands

Now, for the first time, foundries can buy a modern mixing device that truly blends and mixes *without* the crushing action of a rolling wheel!

The Smith Turbine-type mixer is a high-speed rotary unit that gives an intimate mix, ultra-quick dispersion, and superior coating effect to the inert materials through a unique braiding action.

Besides being at least 3 times faster than wheel-type mills, the Smith Turbine has a remarkable grain-coating ability that chalks up noticeable savings of expensive resins when making shell-molding sands . . . gives greater strength to core sands.

The Smith Turbine is compact and easily installed, requires no base or substructure. Available in sizes from ⅓ to 1½ cu. yd. capacity.

Price? So low you'll kick yourself if you buy any other kind of mixer without investigating the Smith Turbine first! If you're interested, we'll arrange a demonstration in your plant — no obligation, of course.

Manufactured by:
THE T. L. SMITH COMPANY
Milwaukee 1, Wisconsin • Lufkin, Texas

SMITH

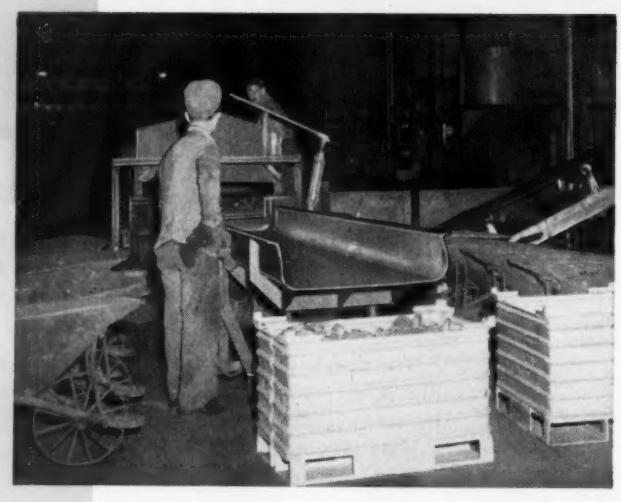
Distributed by:
ILLINOIS CLAY PRODUCTS CO.
208 S. LaSalle St. • Chicago, Illinois

A9-4086

Circle 596 on Page 53

OHIO STOVE COMPANY FOUNDRY holds production costs down with SIMPLICITY equipment

At Portsmouth, Ohio, in the modern foundry of the Ohio Stove Co., the SIMPLICITY 4′ x 6′ shakeout and the 30″ x 17′ model VS-12 conveyor (shown here at work) are helping speed operations and reduce unit production costs. First, snap molds are floor dumped; then both castings and sand are scooped and loaded onto the SIMPLICITY shakeout. The castings are then carried on the SIMPLICITY conveyor to the waiting tote boxes. The many plants that are using SIMPLICITY shakeouts are indicative of their foundry-proved superiority. Get complete facts on SIMPLICITY shakeouts, feeders, and conveyors. Write us today.



SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario
FOR EXPORT: Brown and Sites, 50 Church Street, New York 7, N. Y.

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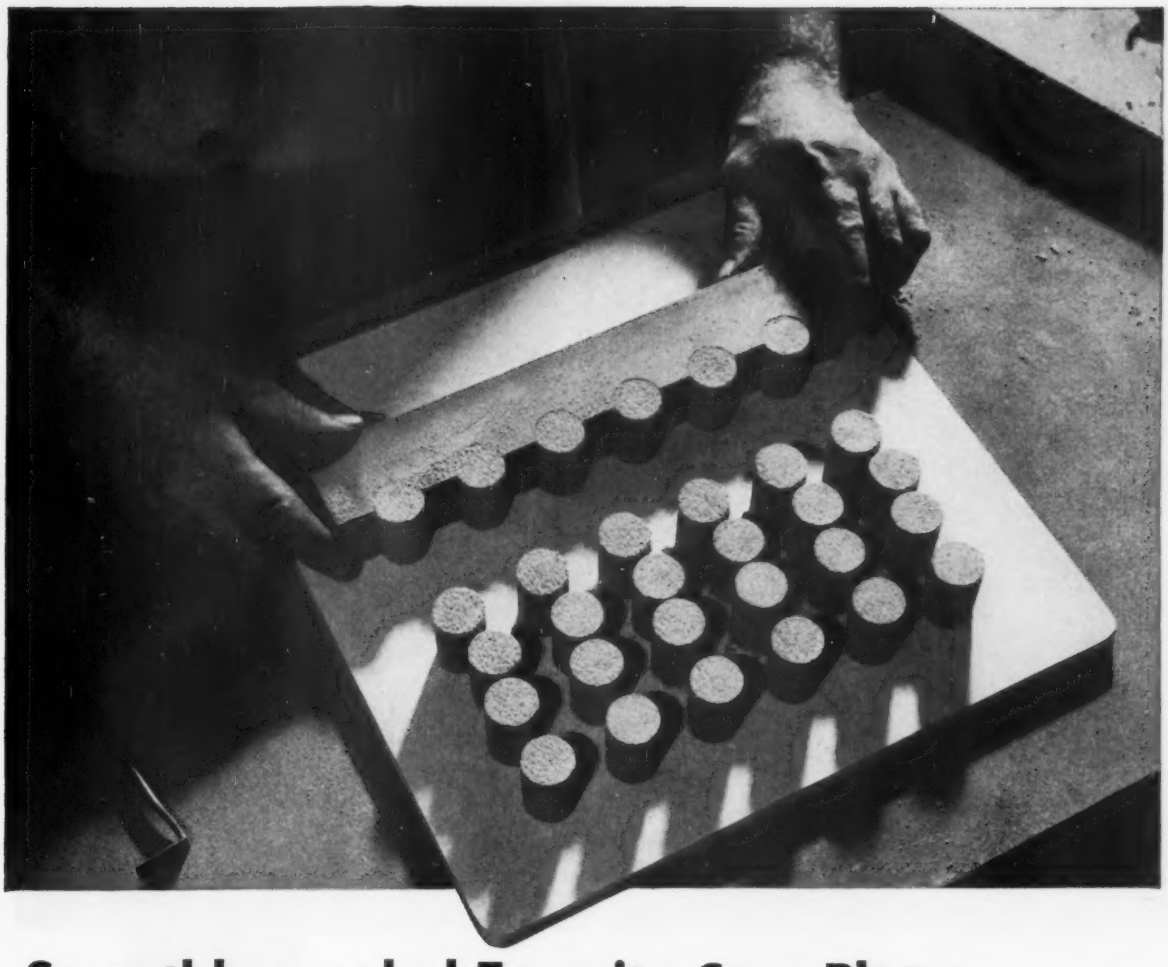
Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND 7, MICHIGAN

Circle 597 on Page 53



Smoothly sanded Transite Core Plates bring new precision to core production

Tough asbestos-cement composition keeps them true over long service life

Experienced foundrymen know they can depend on Transite® Core Plates for fast, accurate production of precision cores, day in and day out . . . even under heaviest production schedules.

For toughness and durability, these smoothly sanded boards are fabricated of fibrous asbestos and cement in a special Johns-Manville process. Extremely strong and lightweight, they resist shock and corrosion, will not crack or break under normal use. Boards can be easily cleaned, too.

Transite Core Plates have proved themselves in hundreds of ferrous and non-ferrous foundries all over the country. They maintain their smooth, level surface year after year with a minimum of warpage and wear.

FREE new folder gives complete information

Whether or not you now use Transite Core Plates, there are many gains to be had from a careful study of our new folder IN-219A. It gives complete specification data—weights, sizes, thicknesses. *Send the coupon below.*

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Please send me booklet IN-219A at no cost or obligation to me.

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Firm_____

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Circle 598 on Page 53

Fyre-Free Clothing

AO Fyre-Free Clothing is recommended for Spot Welding, Drop Forging, Light Metal Splash and similar exposures.

AO's New Line of "FYRE-FREE" CLOTHING

Permanent-Type Flameproofing—takes laundering after laundering or dry cleaning without loss of flameproofing properties

Here's a new line of protective, comfortable work clothing which fills a real need of many workers (and safety directors and industrial purchasing departments).

American Optical "Fyre-Free" Clothing combines the soft feel of an untreated material with the protection of permanent-type flameproofing. The fabric is 100% cotton cloth weighing approximately 11 to 11½ ounces per square yard finished. It has good tensile strength in both warp and fill . . . is long lasting . . . mildew resistant . . . and does not deteriorate in damp climates or operations.

American Optical "FYRE-FREE" CLOTHING CAN BE LAUNDERED AS MANY AS TEN TIMES WITHOUT LOSS OF ITS FLAMEPROOFING PROPERTIES. If exposed to flame there is no afterflame or afterglow.

Available in a complete line of Sleeves, Cape Sleeves with or without Bibs, Regular and Split Leg Aprons, Overalls, Coats, Coveralls, Hip Leggings and Pants. Your nearest American Optical Safety Products Representative can supply you.

Always insist on AO Trademarked Safety Products

American Optical COMPANY
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts
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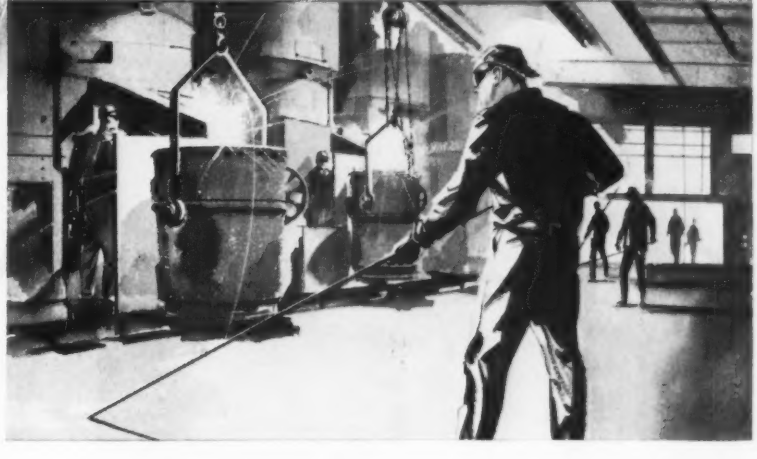
• 125 LEADERSHIP YEARS

Provide maximum protection in the cupola melt zone with Goose Lake FIROX CUPOLA MIX



FIROX Cupola Mix is made of high purity silica, in a carefully balanced screen distribution, and a blend of fine clays. FIROX is the ideal refractory for the melting zone as it produces a strong monolithic lining with a maximum on-the-wall density. It expands under temperature and forms a surface glass to seal out slag and fluxes and retain its refractoriness. It is resistant to high temperatures, air blast, corrosive slags and other fluxing agents. FIROX is produced under strict quality control standards to insure thorough coating and proper sizing of the aggregates. FIROX is easily applied by hand or by air gun . . available in bulk or 100 lb. bags. Write today for information.

FIROX cupola and ladle mix provides extra high resistance to acid slags and erosive action of the molten metal. FIROX improves lining life and reduces melting costs.

ILLINOIS CLAY PRODUCTS CO.

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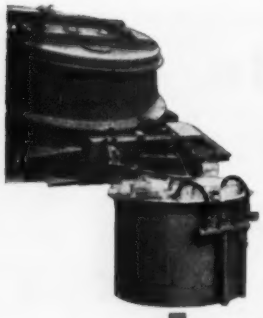
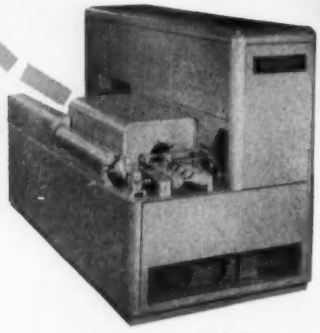
MANUFACTURERS OF: GOOSE LAKE Ladle Brick, Ground Fire Clay, Fire Clay Flour; GRUNDITE Bond Clay; FIROX; THERM-O-FLAKE Insulation Coating, Brick, L.B. Block, Concrete; CHEM-BRIX, Silica, Carbon

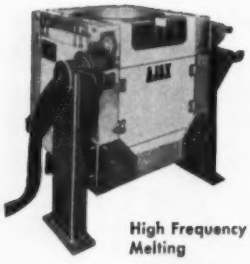
Circle 600 on Page 53



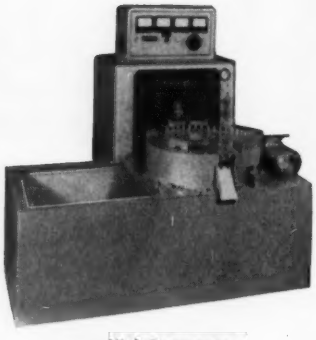
60 Cycle
Non-Ferrous Melting



60 Cycle
Billet Heating



High Frequency
Melting



High Frequency
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- 60 CYCLE CORELESS FURNACES
- 60 CYCLE BILLET HEATERS
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- HIGH FREQUENCY MELTING FURNACES
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INDUCTION HEATING IS

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INDUCTION HEATING

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SOURCE FOR ALL YOUR INDUCTION HEATING NEEDS

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specializing in billet heating for extrusion and forging, heat treating and annealing in frequencies from 60 cycle to 450 KC.

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THIS IS OUR ANSWER TO INDUSTRY'S NEED FOR A FULLY INTEGRATED INDUCTION HEATING COMPANY. EACH COMPANY IS A LEADER IN ITS OWN SPECIALTY OF THE INDUCTION HEATING FIELD.

WE'VE JOINED TO MAKE A COMPLETE LINE OF INDUCTION HEATING PRODUCTS AVAILABLE FROM ONE SOURCE—TO PROVIDE AN AGGRESSIVE RESEARCH PROGRAM THAT WILL MEAN NEW AND BETTER PRODUCTS—TO ENABLE US TO SERVE INDUSTRY BETTER WITH A DECENTRALIZED SALES AND SERVICE ORGANIZATION OF MEN WHO ARE EXPERTS IN THEIR FIELD.

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John A. Logan
PRESIDENT

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CORPORATION

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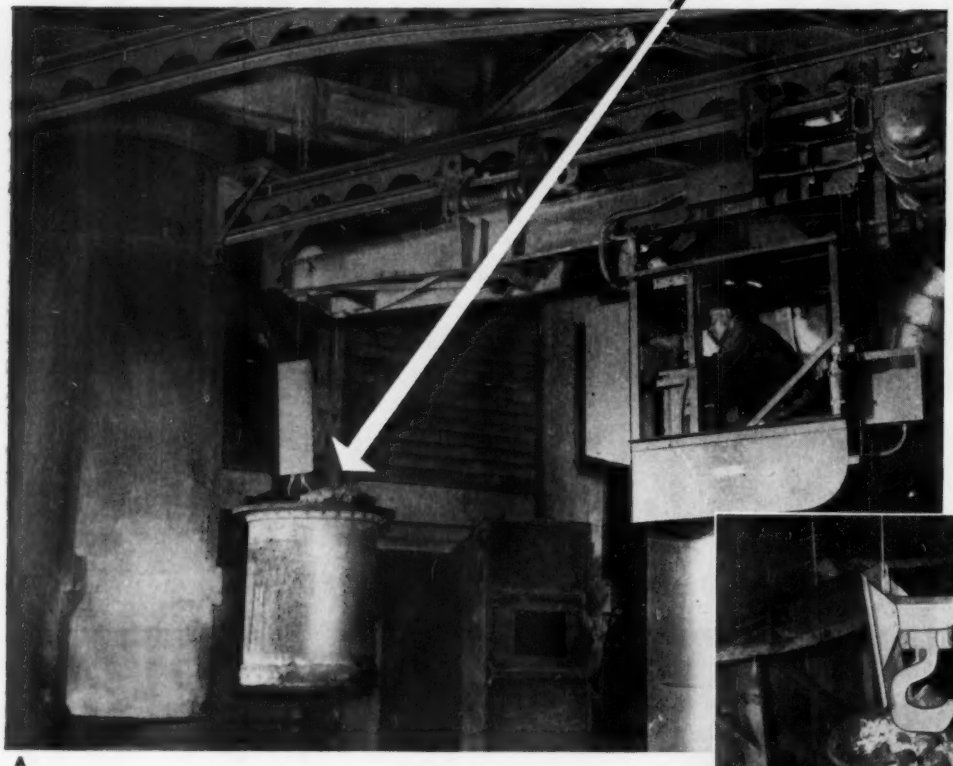
YOUNGSTOWN 7, OHIO

Circle 601 on Page 53

A Radically Different CUPOLA CHARGER

2400 lbs. per charge 22 trips per hour



A

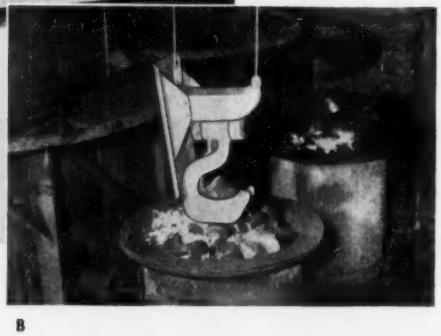
Every 3-minute period a 2400 lb. charge is delivered from the charging floor to any of 4 cupolas with this Tramrail charger.

B

Buckets on floor far below Tramrail System can be hooked or unhooked by means of the special hook by the cab operator alone.

C

One charging carrier operating on this Tramrail track and switch system serves the 4 cupolas which are operated in pairs on alternate days.

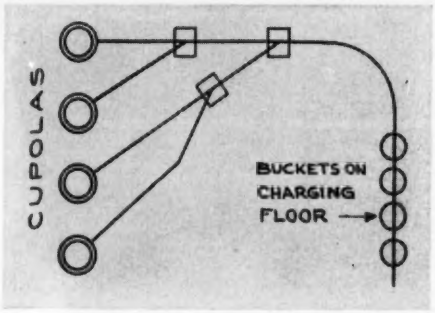


B

Here is a tried and proven Cleveland Tramrail cupola charger that is different from others in that the cab operator alone can hook and unhook charge buckets by means of a special hook without leaving the cab and without assistance of floor men.

A bucket is hoisted from the charging floor, far below, and delivered to anyone of four cupolas. When lowered into a cupola, the materials drop out as the cone-shaped bottom separates from the bucket shell. The Tramrail operator then returns the empty bucket to the charge floor.

This highly efficient cupola charger has been in successful operation in a prominent mid-western foundry since 1940. Iron is melted continuously 20 hours per day.



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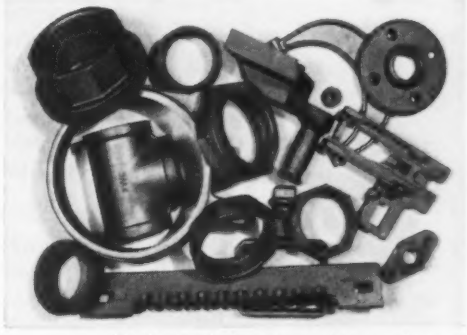
THE CLEVELAND CRANE & ENGINEERING CO.
3837 East 286th Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

Circle 602 on Page 53

This completely equipped testing laboratory maintains a close watch over all New England Malleable production.

New England Malleable maintains high standards with HANNA PIG IRON



Machining is kept to a minimum by precision casting at New England Malleable.

Weighing from less than an ounce to more than ten pounds, the wide range of pipe fittings and other castings produced at New England Malleable Iron Company have one thing in common. They are all fine grain, close tolerance pieces that require a minimum of machining.

This completely mechanized plant at Warwick, Rhode Island, helps assure its high standards with both Hanna malleable and Silvery pig iron. And it checks these standards almost continuously in a complete chemical and physical laboratory which makes hourly tests of the melt, and delivers reports in 30 minutes.

New England Malleable, like many other Hanna customers, counts on the *high metallurgical quality* of Hanna pig irons for the production of denser, stronger castings with *constant* machining characteristics. These features are particularly true of HANNATITE®, a special iron possessing extra-fine grain structure with smaller, uniformly distributed graphite flakes.

Whatever you cast, large or small, there's a Hanna pig iron to do the job best. All regular grades, plus HANNATITE® and Hanna Silvery, are available in the regular 38-lb. pig or the new 12½-lb. pig. For the iron to suit your particular needs, call a trained Hanna representative for assistance.

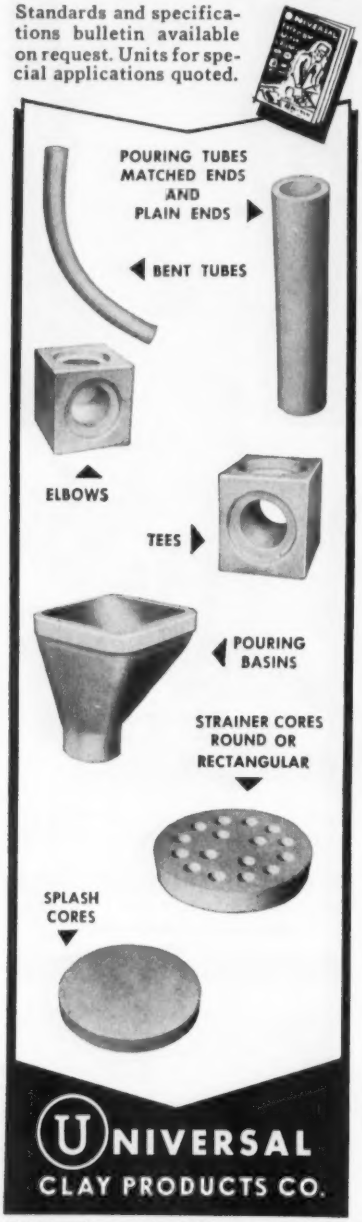
THE HANNA FURNACE CORPORATION
Buffalo • Detroit • New York • Philadelphia
Merchant Pig Iron Division of
NATIONAL STEEL CORPORATION

Circle 603 on Page 53

UNIVERSAL
REFRACTORY GATING COMPONENTS

• The *Thinwal* construction, providing as much as *35% lighter weight* will not spall nor erode in use even at temperatures up to 3250°F. They eliminate slag inclusions, stop rejects, reduce cleaning room time.

Standards and specifications bulletin available on request. Units for special applications quoted.



UNIVERSAL CLAY PRODUCTS CO.
1315 First St. • MAin 6-4912 • Sandusky, Ohio
P.O. Box 1631

Circle 604 on Page 53

Readers' Comment

Confusion in Russia

To The Editors:

The November, 1958, issue of Foundry carried an abstract of an article from the November, 1957, Russian publication *Liteynoe Proizvodstvo* entitled "Major Developments in Soviet Casting Industry." This article indicated the Russians have developed engine blocks in aluminum diecastings and already are in large production.

Since that time we have secured a complete translation of another article which appeared in the June, 1957, issue of the same publication entitled "Production of Automobile Cylinder Block by Pressure Die Casting."

To our surprise, we find that the article refers directly to development work we have done on a 6-cylinder engine block with our 2000-ton die casting machine. In the very first sentence of the Russian article, Doehler - Jarvis, Toledo, Ohio, is mentioned.

Since the weight of the diecasting reported in the article on Russian progress is the same as the one described in the previous Russian article, we wonder if the author of the abstracted article has not confused American developments with those of Russia.

A. F. Bauer
Assistant General Manager
Doehler-Jarvis Div.
National Lead Co.
Toledo 1, *Ohio*

What the Doctor Ordered

To The Editors:

Your April issue featuring the special reports on "Operation Marketing" is outstanding in all respects. The authors are to be congratulated for their important message to foundry management.

In your discussion of the usefulness of castings conferences you mentioned several companies which have very successfully conducted customer clinics.

The current series of regional gray iron castings clinics conducted by our society, according to reports from members and their customers who have attended, has also been just what the doctor ordered. So far over 600 engineers and purchasing people have registered for one of our 23 sessions, past or future.

Customer-Foundry conferences of all types are good for the entire foundry industry. Let's have more of them!

Donald H. Workman
Executive Vice President
Gray Iron Founders' Society
National City-East 6th Bldg.
Cleveland 14, *Ohio*

Suggests Cause of Defects

To The Editors:

I read with interest the description of a problem in "Questions and Answers," pages 97 and 98 in the March issue of Foundry, which had arisen in the production of aluminum rings from plaster and iron molds.

From the general description it would seem that these castings are tire mold tread rings and if this is so, I would like to offer the following comments and suggestions.

From the description and position of the defect, the trouble is almost certainly due to "blowing" of the cast iron die, caused by: 1. Die too cold. 2. Incorrect application of the die wash, if any.

While the blowing will also occur on the vertical outer die wall, this would probably flow off into the risers—but this cannot happen in the defect area since the aluminum has come up to a "dead end."

I would agree with your suggestion that the cross-sectional area of the runner system should increase as it progresses from the downpeg (sprue) to the casting, but I doubt very much whether the problem is, in fact, turbulence. As you say, difficulty would be experienced in pouring into the central bush (sprue) and this should be extended as you suggest. Correction of these points I feel would overcome the defect.

Inverting the mold, as you suggest, does offer some advantages but in the specific application of tire molds there are two serious problems. The first is that it is very difficult to set and position the

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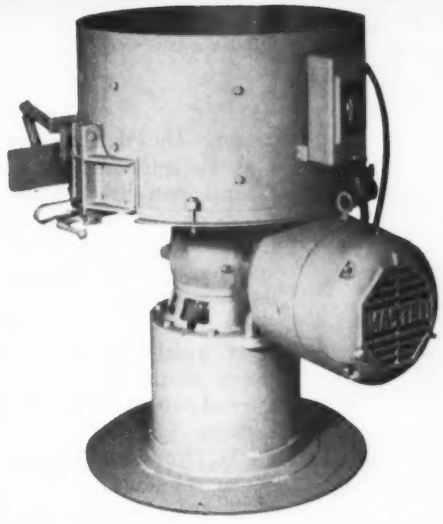
can do a quality job on...

CO_2 SAND*

*(or air-setting, resin-bonded
and oil-bonded core sands)

B&P WHIRLMIX



A SIZE FOR YOUR JOB—Batch capacities of 375 and 750 lbs.—hourly capacities to 22,500 lbs. of fully prepared sand.

	Batch Capacity	Approx. Hourly Capacity Oil and resin-bonded sand	Approx. Hourly Capacity CO_2 and air-setting sand	Motor HP
Model 375	375 lbs.	7500 lbs.	11250 lbs.	5 HP
Model 750	750 lbs.	15000 lbs.	22500 lbs.	10 HP

COMPACT AND LOW COST

The cost is low—well within the budget of even the small foundry—minimum space requirement, too. Yet, capacity is high—two compact, productive models.

FAST AND THOROUGH

Three minute cycle for oil bonded core sands—two minute cycle or better for most CO_2 and air-setting sands. Thorough uniform mixing with *no lumps and no crushed grains*—full control of sand properties.

EASY TO INSTALL—EASY TO USE

No pits or foundations for installation—just plug in. Low loading height, high discharge makes it easy to use.

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Low power requirement—short cycle keep operating costs low. Clean rugged construction, replaceable wearing parts, totally enclosed drive keep maintenance costs at a minimum.

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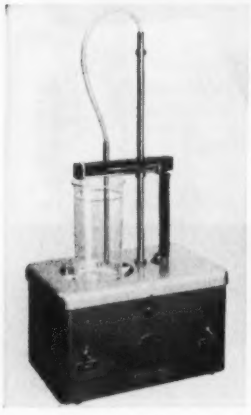
Circle 605 on Page 53

POUR CLEANER-FINER CASTINGS

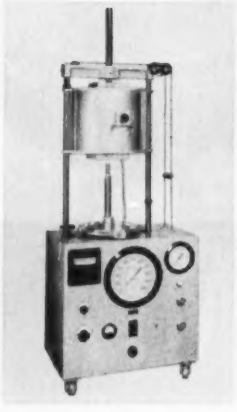
CONTROL

√ CLAY CONTENT
√ HIGH TEMPERATURE PROPERTIES
√ MOISTURE
√ METAL FLUIDITY
√ HARDNESS

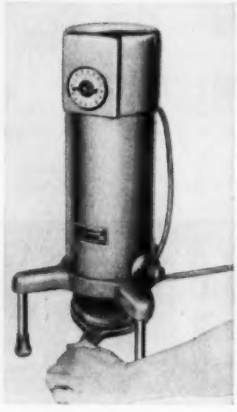
...with DIETERT-DETROIT CONTROLS



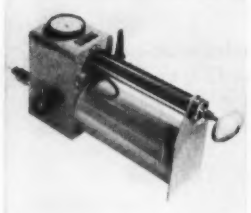
AUTOCLAY ... No. 513
Saves operator's time in running A.F.S. clay substance test. Better castings and easier molding result from sands with controlled clay content.
To obtain better casting finish, improve sand grain distribution, control fineness.



THERMOLAB ... No. 785
For clean castings, free of defects. Test and control the high temperature properties of your molding materials with the Dietert-Detroit Thermolab. Reduce or eliminate scabs, cuts, etc.

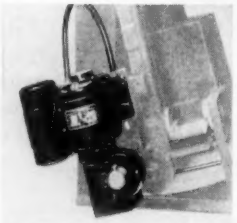


MOISTURE TELLER ... No. 276
Control moisture content in your molding sands and you will control the greatest variable causing defects in any foundry. The No. 276 takes but a few minutes to check moisture content.



RAGONE ... No. 4210
Measure fluidity of ferrous and non-ferrous metals in seconds. Take the guess-work out of pouring requirements—know when your metal will flow properly to fill the mold.

MOLD HARDNESS TESTER ... No. 473
Molds too soft? Rough surface can result. Molds rammed too hard? You may get rat-tailed or buckled castings. Be sure your molds are properly rammed, use the No. 473 Hardness Tester.



MOTOR DRIVE ... No. 401
Eliminate the human variable of hand loading ... equip your hand-operated sand strength machine with a No. 401 Motor Drive.

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☐ Thermolab No. 785
☐ Moisture Teller No. 276
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☐ Mold Hardness Tester No. 473
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Company_____
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City_____ State_____

plaster cores in this position with sufficient accuracy, since any variation in die temperature will affect the diameter. This problem, however, is not insoluble.

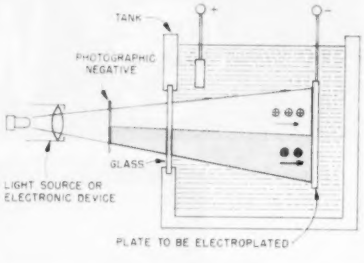
The second and most serious problem is that any turbulence or oxide film formed during casting will float up against the plaster face. The castings may appear perfectly satisfactory, but the very high pressures used in tire production and the severe "searching" effect of rubber will in all probability lift the oxide films from the casting, leaving a very rough surface.

JOHN ARMSTRONG
254, *Lutterworth Road*
Nuneaton, Warwickshire
England

Suggests Research Project

TO THE EDITORS:

The article "Now They're Casting Photos" in the February issue of FOUNDRY gave me an idea for another method of making a casting



pattern. The idea involves placing a photographic negative in front of an unknown light source or electronic device which is capable of increasing ion velocity in an unknown electrolyte. Variation in light intensity shining on a plate in the electrolyte will attract greater or lesser metal particles in the electrolyte to the plate, thus creating a metal pattern of the photographic negative.

The idea presents many subjects to be researched: What kind of light source or electronic device is needed to increase ion velocity, and what kind of electrolyte and metal would be used?

These are my ideas which I offer to those having interest in the project.

DANIEL CHA
Yung Shing Cotton Mill & Machine Works
Nei-Li, Chung-Li
Taiwan, China

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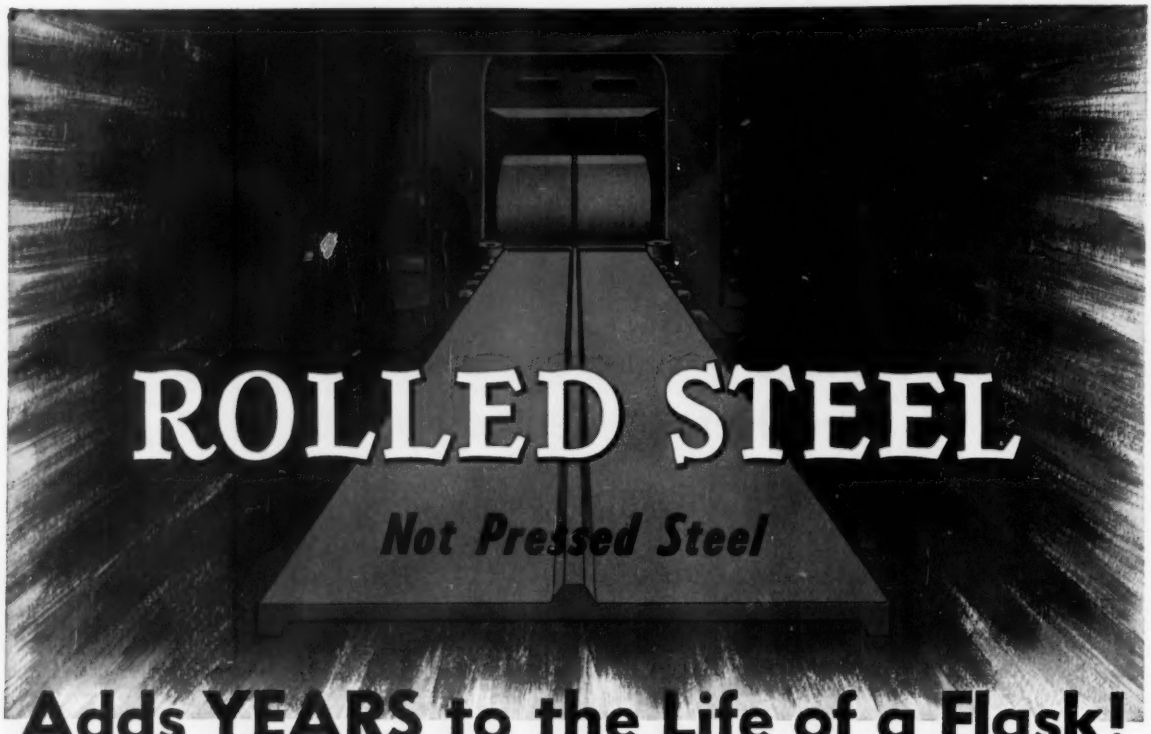
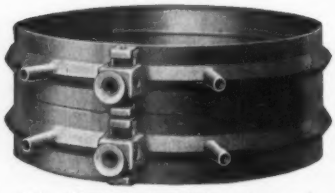


Adds YEARS to the Life of a Flask!

Style "AD" Flask with Double Pin Lugs.



Style "BLDT" Flask with Trunnions and 2-man Lift Handles.

Heavy Duty Flask, style 3/8 ND-RTX cope and 3/8 NS-RT drag, with clamping bars and clamps.

Every Sterling Flask is carefully fabricated from special hot rolled steel channel having tensile strength up to 70,000 lbs. The steel also has controlled carbon content and copper bearing . . . features that add years to the life of the flask, even under tough everyday usage. This construction gives you the practical combination of maximum strength with minimum weight. It assures accuracy and speed in molding. Check these distinctive Sterling features: All-steel welded into one solid, rigid piece . . . A rib rolled in the center of each section to resist torsional and other strains . . . Heavy rolled steel sand flanges with square corners and full width bearing . . . Partings accurately machined, not just surface ground, but planed to an accuracy of .005". And there's plenty of metal left for re-machining if necessary. Frankly, can you think of any other foundry flask that gives you so many life-prolonging features?

Consult Sterling when in need of foundry flasks or other foundry equipment.

Sterling

STERLING NATIONAL INDUSTRIES, Inc.

Founded 1904 as STERLING WHEELBARROW CO. • Milwaukee 14, Wisconsin, U.S.A.

Associate: STERLING FOUNDRY SPECIALTIES LTD. • LONDON • BEDFORD • JARROW-on-TYNE, ENGLAND

PIONEERS IN THE MANUFACTURE OF FOUNDRY FLASKS AND EQUIPMENT

A-7272-R2

Circle 608 on Page 53

WHEREVER METALS ARE CAST — FOUNDRY
June 1959

With the Leaders

Of all the changes that have been taking place in the foundry industry, the most important probably concerns the product itself.

To meet the ever growing demands of customers and the competition of other materials and processes, many foundrymen are producing engineered components in cast form. This type of casting not only meets the purpose for which it was designed, but also provides a solid basis for extending the use of castings to new fields.

Visitors at the recent Engineered Castings Show in Chicago saw a good demonstration of this progress. Castings made of virtually every metal and by every process showed remarkable improvement over those produced at the close of World War II. Engineers found adequate evidence that their use of high-quality engineered castings in engineering construction can save money and contribute to a more satisfactory final product.

Engineers find that developments in casting processes permit great savings in machining costs by providing components with close dimensional tolerances and exceptionally fine surface finish. Alloys that cannot be machined are cast to usable shape.

Production and metallurgical techniques result in physical and mechanical properties that will more than satisfy the engineering requirements of a high percentage of all component applications.

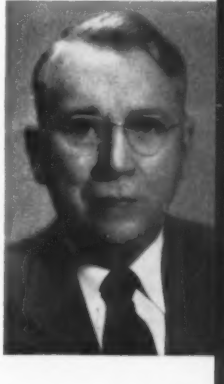
Complicated shapes that would be most expensive to produce by other methods of fabrication can be cast by the experienced foundryman with savings in cost and improvement in the resulting component.

Surely the users of components who saw the castings at Chicago, who have studied the literature provided by progressive foundries specializing in that type of work, or who have seen today's engineered castings applied to everything from automobiles to rockets and from dies to household equipment, are beginning to realize that castings offer exceptional opportunities to them in the design of their products.

If the message has not reached some designers as yet, progressive foundrymen are working hard to spread the news.

As time goes on, more foundrymen will see that the future of the foundry industry lies in the field of high-quality castings engineered to meet exacting requirements and produced at a cost that is competitive and at the same time provides a fair profit for the foundry organization.

Where does your company stand on this important project? Do you have the facilities and the know-how to meet this challenge of the immediate future? Can you move forward with the leaders?



Frank G. Steinebach
Editor

Worker scoops sand binders from shelves at bottom of bins to pan on scale which rolls on rails

Modernized Steel Foundry

Boosts Production Capacity

LFM Mfg. Co. increases foundry working area and castings production capacity by 50 per cent. Production facilities are described in this article

By ROBERT H. HERRMANN
Associate Editor

● EXPANSION and improvement of foundry facilities, involving nearly $3 million, has increased the foundry working area at LFM Mfg. Co., Atchison, Kans., from 200,000 to 300,000 sq ft. It has also raised production capacity from 2000 to 3000 tons of finished steel castings a month.

The original modernization program, conceived in 1955, was designed to permit the foundry to handle larger castings and to improve flow of work through the plant, achieving economies through better handling. When LFM merged with Rockwell Mfg. Co. in January, 1956, the program was expanded to increase tonnage capacity as well.

Work on the project started in February, 1957, and in the summer of 1958, when the job was nearly complete, the floods came. Twice within three weeks cloudbursts caused flash floods which inundated the narrow triangle of land on which the foundry and other buildings are situated along the Missouri River. Nearly 6 ft of water raged through the buildings, breaking walls and damaging equipment, furniture, and records. The mess was cleaned up, damage repaired, and the modernization program completed in December, 1958.

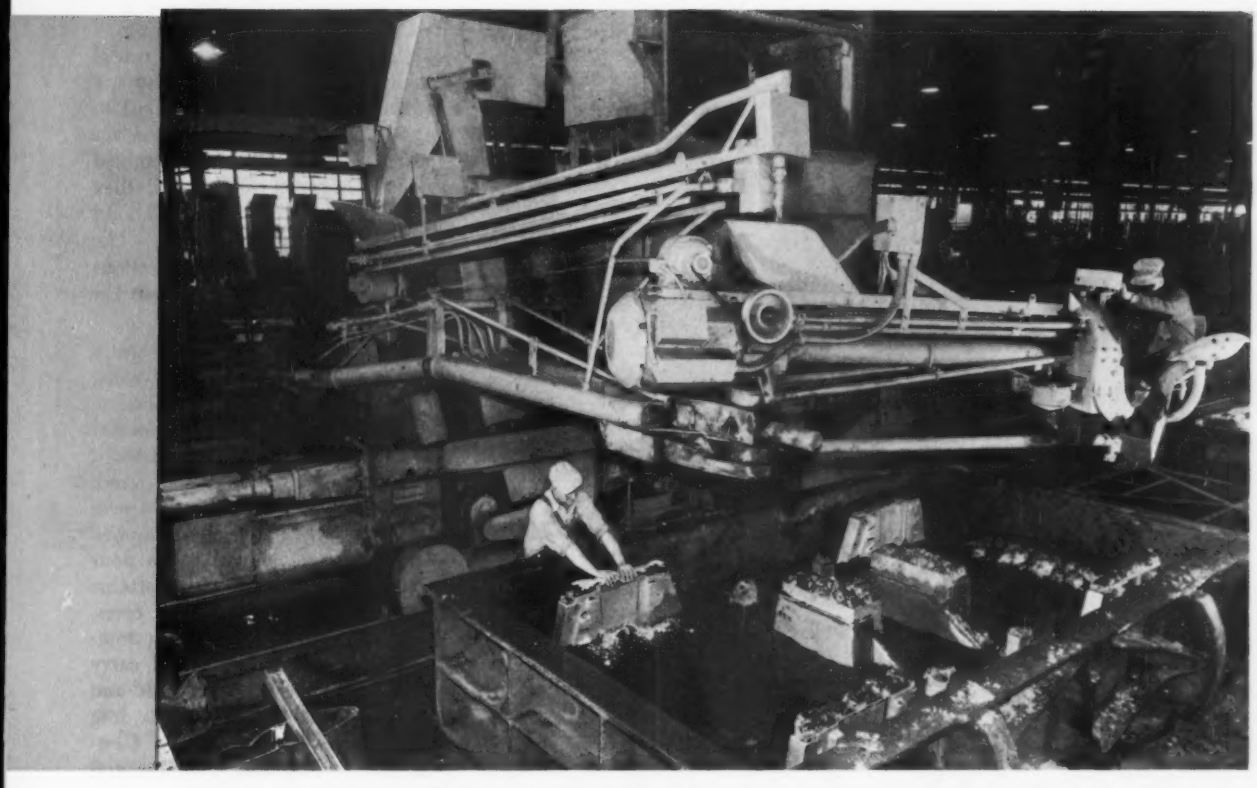
The project included new buildings for melting and scrap storage, castings cleaning, patternmaking, and pattern storage. Additions were built onto the main foundry and office buildings. New equipment included patternmaking tools, a melting furnace, heat treating facilities, molding machines, cranes, conveyors, and an enlarged sand reclamation and distribution system.

With its extensive steel foundry and machine shop operations the company produces castings weighing from 100 to 35,000 lb and finished parts for the gas, oil, chemical, locomotive, and road-building machinery industries.

Sand Handling—Box cars delivering dry, AFS 55 sand enter the foundry building on a siding. Sand is removed with a cable drag to a 10-ton bucket resting in a pit. When full, it is lifted by bridge crane and the sand dumped into a 600-ton capacity open-top bin. Two 50-ton capacity hoppers within this bin are kept filled with sand transfered from the large bin by clamshell bucket and crane. Each of the hoppers is intended to serve separate sand preparation systems, but distribution equipment is so designed that the hoppers can serve either system. Because equipment installations on the second system are not yet complete, all sand is diverted to System No. 1.

Screw conveyors under the two system hoppers feed bucket elevators which empty to distributing belts. On System No. 1, sand is distributed to three overhead muller supply hoppers. Each is divided into a 50-ton compartment for new sand and a 150-ton compartment for system sand. A weigh larry traveling on rails under two of the hoppers supplies sand to two, 3000-lb batch capacity semiautomatic molding sand mullers. The third hopper serves a core sand muller of 800-lb batch capacity.

Bonding materials, including silica, corn, and wood flours, western bentonite, and iron oxide are received in bags and hoisted to a mezzanine where they are broken over hatches on six, 35-cu-ft capac-



One of the two mobile slingers rams a four-wheel railroad car truck mold

ity bins serving the molding sand mullers. The materials flow from the bottoms of the bins to small shelves from which they are scooped to a pan on a scale which rolls on rails just in front of and below the shelves. Weighed bonding materials are dumped into the mullers, and water is metered in.

Mullers discharge molding sand to 15-ton, bottom-gated buckets resting in pits in front of each muller. A bridge crane carries the buckets to one stationary and two motive slinger units. Permanent buckets on the slingers are kept stocked with sand without interrupting molding operations.

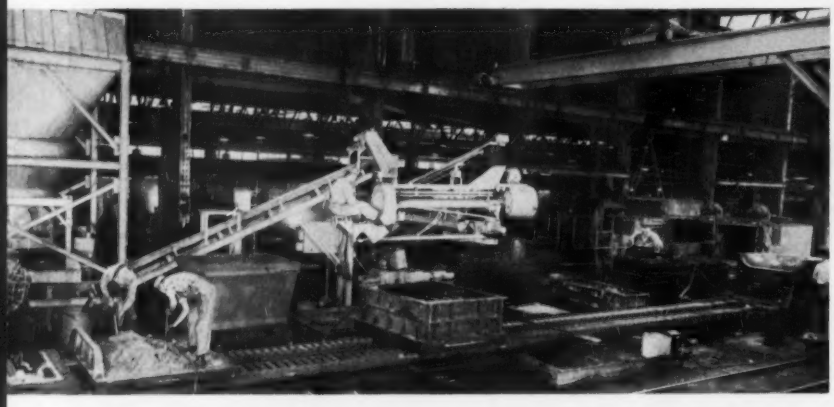
Facing sand mixes are delivered in the same way to floor-level bins stationed around the foundry. Sand flows from the bottoms of these units and is shoveled onto patterns in the flasks.

The two-compartmented sand hopper over the core sand muller is equipped with a weigh hopper for measuring sand. Binders from four bins are weighed in the same manner as those for molding sand. Water is metered and core oil measured by volume. Prepared sand batches are discharged to a pressure chamber and blown through a tube to a storage hopper in the coremaking area.

Technicians test samples of prepared molding and coremaking sand at regular intervals throughout each working shift. Sand properties must fall within close tolerances of a strict quality control program.

Sand Reclamation — Sand from two large vibrating shakeouts and a drag dump is handled by vibrating feeders and oscillating conveyors to inclined belt conveyors. After

Facing sand mix is hand-rammed around a board-mounted valve pattern on the U-shaped roller conveyor line



The stationary slinger rams a mold on the straight-through roller conveyor line. Facing sand is being rammed with pneumatic tools at left

traveling over a magnetic pulley and through a rotating screen, the sand is raised by separate bucket elevators to distributing conveyor belts.

The belt from the 8 x 10-ft shakeout serves hoppers over the mullers of System No. 1. Sand from the 10 x 12-ft shakeout and from the drag dump is discharged to a second distributing belt which operates in either direction to serve muller supply hoppers in both sand preparation systems.

A flip gate at top of the elevator for the smaller shakeout diverts some of the screened sand to a 100-ton storage bin. A belt under the bin feeds sand to a gas or oil-fired rotating dryer. Dried sand is elevated to a vibrating screen and falls through to a belt from which it is plowed into three compartments of a rectangular bin. Each compartment feeds a scrubber unit in which air circulates the sand to knock off carbonaceous material, clay, and fines.

Reclaimed sand comes out the bottoms of the scrubbers to a belt and is deposited in a 10-ton capacity bucket. A bridge crane carries the bucket to the new sand storage bin where it is dumped. Bag-type dust collectors handle air discharged from each of the scrubbers.

The reclamation system has an hourly capacity of 8 tons of sand with a 1 per cent clay content.

Molding—The main bay is 780 ft long, 75 ft wide, and 35 ft high to the crane runway on which four bridge cranes with capacities of 15 to 50 tons ride. Three 7½-ton gantry cranes work under the bridge cranes. Two motive slingers, operating on a single track down the center of the bay, ram all the large molds.

Large, miscellaneous floor and pit molding is done at the south end of the bay. Rectangular, cast steel flask sections range in size from 3 x 4 ft to 12 x 12 ft. A few round flasks about 6 ft in diam also are used. Flask sections are stacked to any desired height and bolted together. When flasks are assembled to make a rather high mold, they are placed in either of two 28 x 14 x 8-ft-deep pits for ramming. The pits may be divided into sections by inserting boards into slots in the side walls.

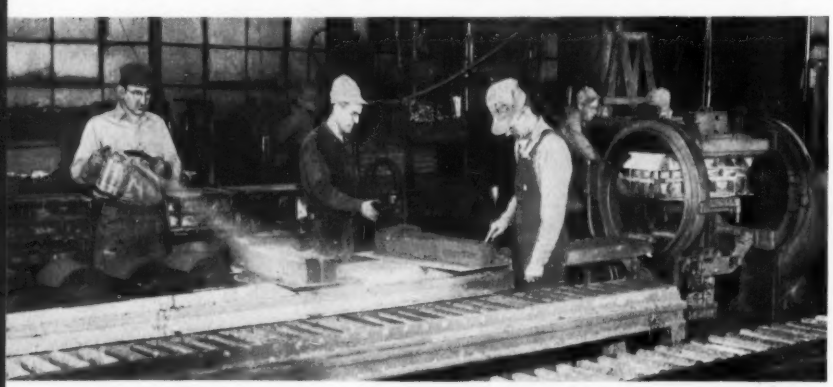
Cope and drag patterns, mostly of wood, are used on standard wood or metal bottom boards. Facing sand is shoveled on and rammed by hand or with pneumatic tools. Slingers ram the back-up sand. Gantry cranes roll the molds over and draw the patterns. Rammed molds are sprayed with silica flour wash and skin dried with portable gas torches. Cranes also set cores, close the molds, position bottom-pour ladles for pouring, and carry copes to a vibrating shakeout and drags to shakeout or the drag dump, depending on size. Castings are pulled from the drag and set on shakeout to break up internal cores and remove excess surface sand.

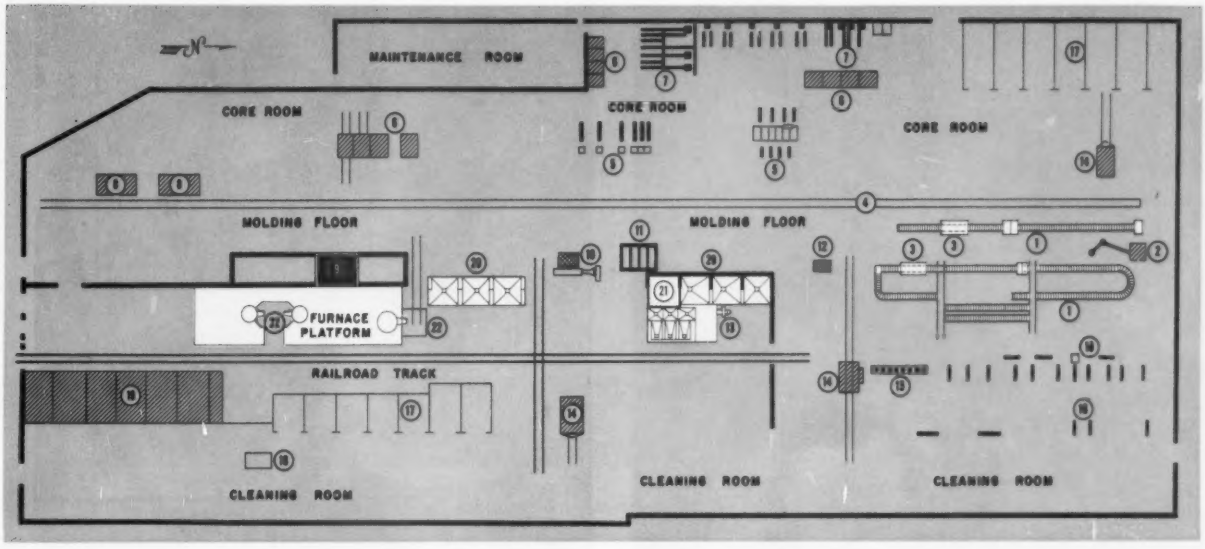
Center Bay Molding — Locomotive truck frame and bolster production is concentrated here. Flasks are 10 x 13 and 11 x 18 ft, both about 3-ft deep. Patterns are mounted on steel plates and are either aluminum, or wood covered with stainless steel sheet. Drags are made in one piece with facing sand and slinger-rammed backing sand. Trunnions cast onto the sides of the flasks permit a crane to roll them over on the floor. A crane draws the pattern, and molds are skin dried.

Copes for truck frames are made in three or four sections, depending on whether the truck frames are for four or six wheels. Flasks are about 4½ x 10 or 11 ft, depending on the size drag on which they will be assembled. A flask for a section of the cope is set on the pattern plate which rests on an air cylinder lift table the same size as the plate. When the flask is rammed, the table lowers with the pattern and deposits the mold on four pedestals.

A crane moves the cope and sets it upside down on a stand so that molders can work underneath it to

Cores are sprayed on one of the conveyorized coreblower lines. A roller-top transfer car can be seen in front of rollover draw machine at right





Layout of foundry shows adjacent arrangement of core room, molding floor, and cleaning room for minimum handling of material in production

KEY TO LFM FOUNDRY LAYOUT

1. Roller conveyor molding lines
2. Stationary slinger
3. Skin drying tunnel
4. Motive slinger tracks
5. Conveyor and bench coremaking
6. Groups of core ovens
7. Coreblower groups
8. Molding pits
9. Metal testing laboratory
10. Large shakeout
11. Drag dump
12. Small shakeout
13. Sand reclamation units
14. Blast cleaning rooms
15. Casting cut-off turntables
16. Casting cleaning benches
17. Heat treating furnaces
18. Quench tank
19. Metal storage bins
20. Muller sand storage bins
21. Sand laboratory
22. Electric furnaces and tapping pits

do finishing work and spray and dry the surface.

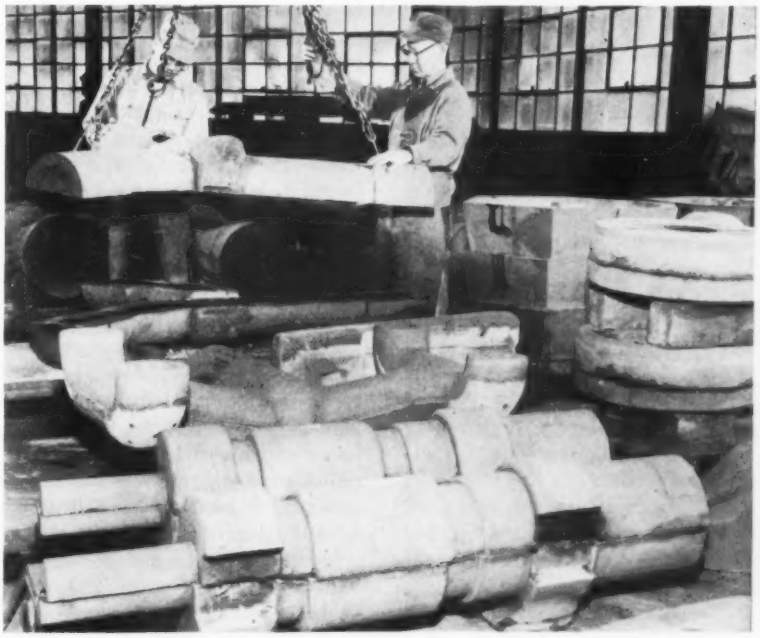
In the meantime molders, using a crane, set cores in the drag, including bridge cores at points where cope segments will join. These latter cores prevent metal runout between the cope segments. After molders set cope segments in place, they are bolted to the drag flask, and a dry sand pouring basin set on the sprue opening. Copes for bolsters are made in one piece.

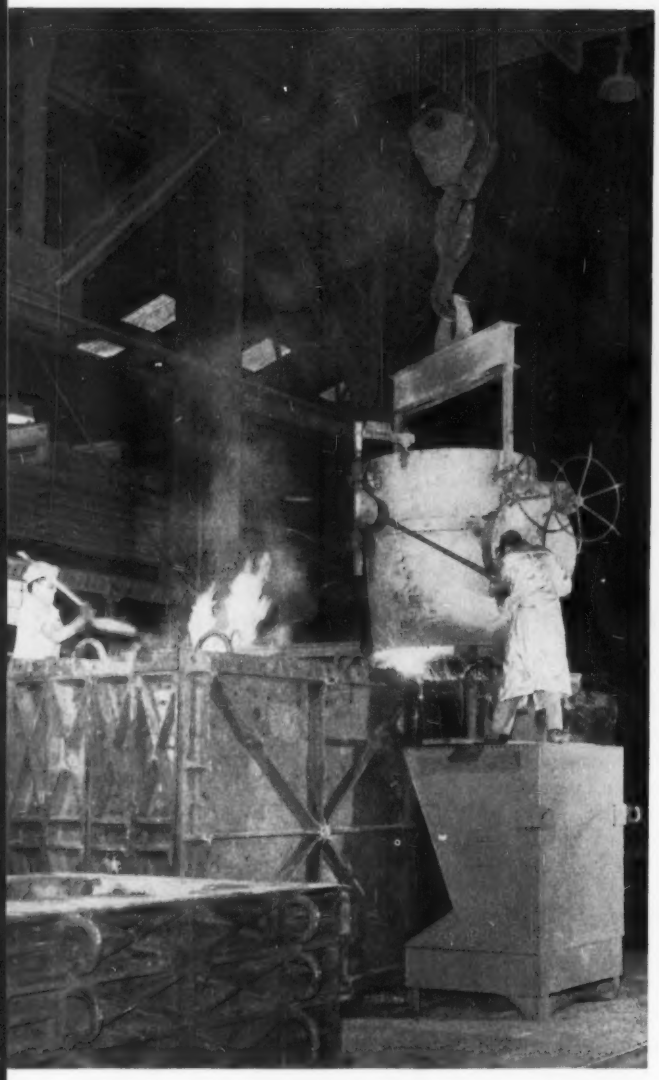
North Bay Molding — Smaller castings, mostly valve parts, are produced on two gravity roller conveyor systems about 18 in. above the floor. Both are served by a single, stationary slinger. One system is U-shaped and handles 38 x 42-in. flasks. Cope and drag patterns are mounted on plywood boards which fit into aluminum mounting plates. Inserts are changed frequently because most orders are for fewer than 20 castings of a kind.

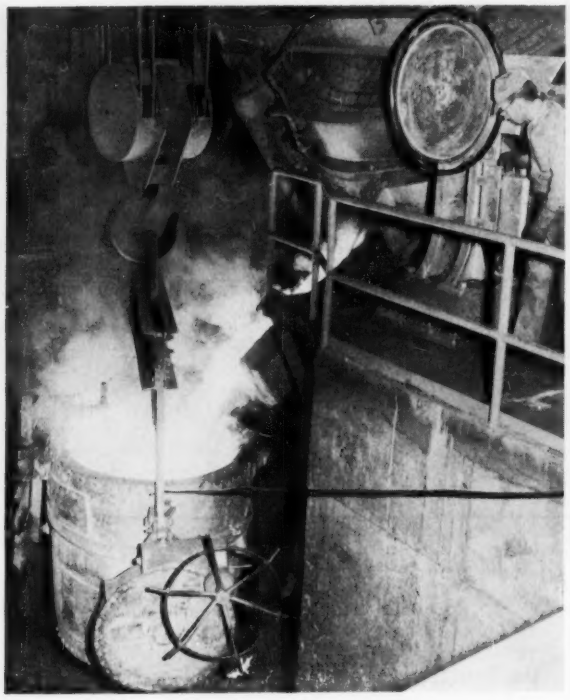
At the facing sand ramming station, alternate cope and drag pattern and mounting plate assemblies are set on an air-cylinder-raised section of conveyor, which positions the assemblies at convenient height for placement of chills used on some jobs and the shoveling in of facing sand. Then the flasks are set in place and the assemblies pushed around the U of the conveyor to the slinger ramming station. Farther along the conveyor the rammed molds are struck off and steel bottom boards bolted on.

The half molds then are pushed onto a rollover draw machine, the mold drawn off on the far side and the pattern rolled back. Pattern assemblies are pulled back on the roller conveyor to a transfer car and rolled along floor rails to the starting end of the loop. Workers hand-finish half molds, spray them

Baked valve core halves are assembled in the south end of the core room







Tapping a heat from the 7½-ton electric furnace to a ladle lowered by crane into the pit

Molds from the roller conveyor lines are set on end for pouring with a bottom-pour ladle

with wash, and push them into a drying tunnel.

As molds emerge from the tunnel, cores are set in the drags, and copes lifted by chain bail on a crane to close the molds. Cope and drag are bolted together, picked up by the crane and set on edge on the floor. A dry sand pouring basin is set over the sprue opening formed into one side of the mold which now becomes the top.

This method of production is used because the casting and gating system patterns are mounted horizontally to facilitate molding. However, because a certain section of the casting should be up, or on the cope side, for pouring, and the gating system could be simplified, the mold is tipped 90 degrees.

The second roller conveyor molding line is a straight-through unit handling flasks of 48 x 60 in. and 60 x 72 in. Production is in the same manner as on the U-shaped line. The gravity roller conveyor, however, is divided, with a hydraulic-cylinder-indexing unit mounted between the two sets of rollers to move pattern - flask assemblies through the various stations.

Coremaking—Cores are made in a bay adjacent to the molding bay. Delivery distance is short, because cores are assembled in sets on the borderline between the two areas. Large cores used in the south and center bay molding areas are hand-rammed or made on a jolt table near those areas.

Most of these cores are coated with wash in the green state and baked in two car ovens or two rack ovens in the area. One of the car ovens has doors on each end so that a few dry sand molds made in the coreroom may be moved straight through to the molding floor. Trucks move other cores to the south end of the bay for finishing and pasting. Paste is dried with portable gas torches.

Medium-sized cores are hand rammed at midpoint of the coremaking bay in an area adjacent to the molding bay. Coreboxes rest on sets of rails at eight ramming stations. Four rack ovens in the area bake these cores.

Three conveyorized coreblower systems to the west of this area produce cores weighing from 25 to 300 lb. The conveyors are waist-high gravity roller units. At the first blower, cores are set off on boards

Valve castings are placed on small turntables which can be turned by the operator as he cuts off risers with an oxyacetylene torch

on one conveyor for finishing work, then loaded on racks for baking. Boards are returned on a parallel conveyor.

The other two machines handle larger cores and are equipped with pneumatic rollover draw devices. Cores come out of the rollovers on steel plates, then roll to a roller-top transfer car which aligns with three roller conveyors. Cores are finished on these conveyors. The car carries coreboxes from one of the machines to a conveyor along which the boxes are pushed past the machine to another transfer car. It aligns with the conveyor leading to the coreblower entrance. Boxes from the rollover on the third machine simply are pushed back into the machine for blowing.

Twelve hand-ramming stations are situated north of this area along the outside wall of the building. One overhead sand hopper serves each two stations. Cores weighing from 50 to 1000 lb are rammed in boxes setting on rails in front of each station. Three blowers for cores up to 100 lb are along the outside wall north of this area. Cores are set off on plates on waist-high roller conveyors for patching and coating. They are baked in two drawer ovens or four rack ovens situated on the centerline of the coremaking bay.

An area behind these ovens is devoted to finishing and pasting of valve and smaller locomotive truck cores. Finished cores also are assembled here on pallets or skids for trucking to the molding floor. Just south of this area, eight coremakers make small cores on two rows of four benches placed back-to-back. Overhead sand hoppers are erected between the rows of benches.

Core sand blown from the muller is received in an overhead hopper mounted at midpoint of the coremaking bay. Bottom-gated boxes mounted on wheels are rolled under the hopper and filled. Then they are rolled out and lifted by pendant-controlled bridge crane for movement over the numerous hoppers serving coremaking operations.

Inspectors in all coremaking areas examine all cores visually and gage them before they are assembled into sets for delivery to the molding floor.

Melting—Metal is melted in three electric arc, basic-lined furnaces having capacities of 7½, 20, and 35 tons. The furnaces are situated on a 9-ft-high platform, which leaves furnace machanisms exposed below the platform for easy maintenance.

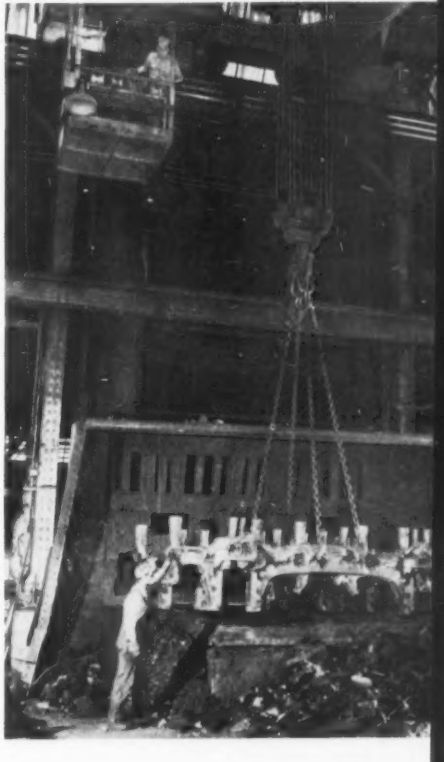
Gondola railroad cars bring scrap into the building, where it is unloaded to storage bins by a bridge crane magnet. The same equipment makes up charges in orange-peel-bottom buckets, resting on electronic load cells. Metal charges consist of 55 per cent purchased scrap and 45 per cent foundry returns. Limestone, which makes up 3½ to 4 per cent by weight of the metal charge, is weighed into drop-bottom buckets on the melting platform. Both charge buckets are moved to the top-charged furnaces by crane.

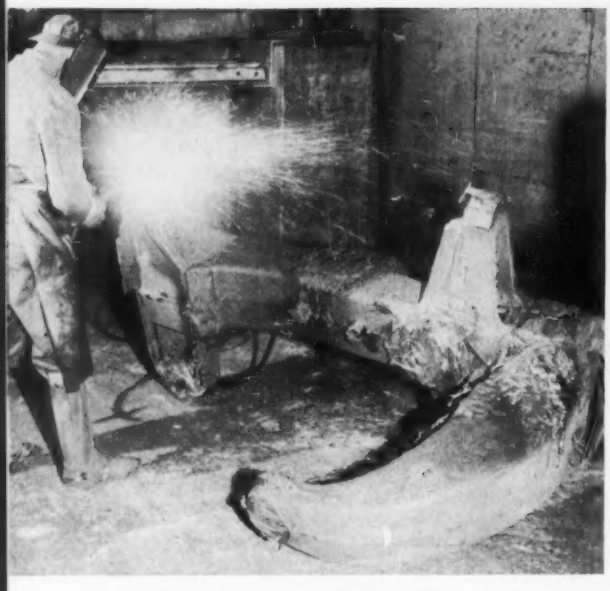
Tap-to-tap cycle on each furnace is 3 hr. Just before tapping, the batch is boiled with an oxygen lance for 3 or 4 minutes to reduce carbon. Average tapping temperature is 2910° F. About 75 per cent of metal produced is carbon steel with an analysis of 0.65-0.80 Mn, 0.35-0.50 Si, 0.20-0.26 C, 0.05 max P, and 0.05 max S. Alloy steels poured include nickel, chromium-molybdenum, manganese-molybdenum, and nickel-vanadium.

A quality control enginer in a laboratory on the melting platform takes several samples from each heat for analysis on a direct reading spectrometer. Another spectrometer test is made on a bar poured with the casting and results are compared with the first test. Carbon and sulfur tests are made by combustion methods, volumetrically. Tensile and yield strength, reduction of area, elongation, and impact values for the bars are obtained. Brinell and Jominy hardness tests are conducted when specified.

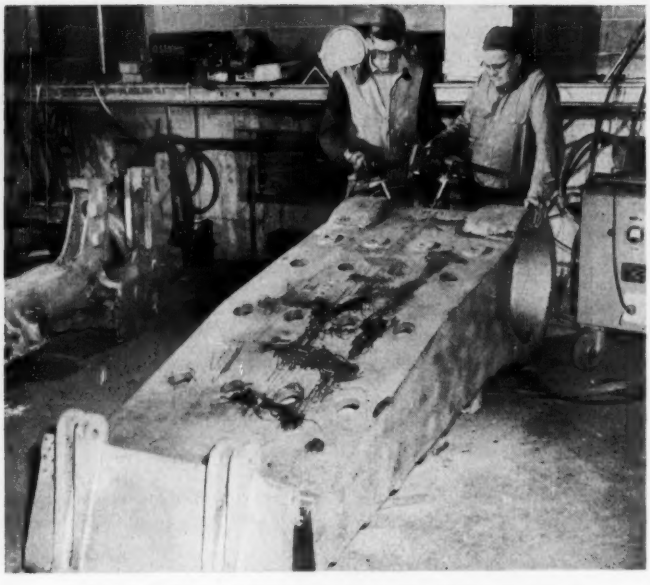
The 7½ and 20-ton furnaces are

A crane operator moves a four-wheel railroad car truck frame to a vibrating shakeout





Arc-air torch operator removes stubs and fins from steering arm for road-building equipment



This rock crusher component is inspected with portable magnet particle testing equipment

tapped to ladles positioned by the crane in a common pit. A separate pit serves the 35-ton furnace. Ten, 15, 25, and 35-ton capacity, bottom-pour ladles are used. The bridge crane carries them to an electrically-driven car for movement to the molding area where another bridge crane positions them over molds for pouring.

Castings Cleaning — Castings from each shakeout are loaded onto large cars. A truck tows them into the cleaning room. The car at the north end contains mostly valve and other castings produced on the roller conveyor molding lines. Castings are unloaded to the floor and a heat number stamped on them. Workers use oxyacetylene torches to cut off gating metal and electric arc torches to remove the gate stubs left from that operation.

These castings are loaded into another car for movement into a shot blast room. The car is pulled out the other side of the room and a crane sets individual castings on small turntables so they can be turned by an operator as he cuts off risers with an oxyacetylene torch. Risers fall to tote boxes for movement to the melting department.

Castings are transferred to benches for removal of riser stubs, fins, and defects by arc-air torches. Workers also perform repair welding and grinding at these benches. All castings are inspected with portable magnetic particle testing equipment, then loaded on gridded metal skids and carried by crane to annealing furnaces. Scale resulting from the annealing operation is cleaned off in a tumble-blast machine or in a shot blast room, depending upon casting size.

Large castings, including locomotive trucks, bolsters, large valve bodies, and crusher equipment, are loaded on the south transfer car and moved into the large cleaning bay, measuring 60 x 780 ft. A crane transfers castings to a second car for movement into a walk-in type blast cleaning room.

On removal from the blast room, the castings are placed at work stations along each wall of the long bay for removal of gates, risers, etc., and repair welding. Straightening operations are performed on a 300-

Doors for annealing ovens in this group situated in the large castings cleaning bay are integral parts of the cars on which castings are loaded

ton top press or a 600-ton side press in this large bay.

The company's quality control program calls for visual inspection and gaging of all castings. Portable magnetic particle testing equipment and radiographic equipment are available for castings requiring such inspection. Responsibility for quality rests with a control group consisting of one man from each of the foundry departments. The group meets weekly to discuss and solve quality problems.

Heat Treating — Six annealing furnaces, five measuring 10 x 16 ft and one 10 x 22 ft, are situated on the inside wall of the large cleaning bay just south of the shot-blast room. These are car-type furnaces with the doors mounted on the outside ends of the cars. Cars are moved in and out of the furnaces by a crane pulling on a cable which runs through a ring on the floor. A 10 x 16-ft recirculating draw furnace, situated at the end of the row of annealing furnaces, is equipped with a self-propelled electric loading car. A 25 x 14 x 12-ft-deep water quench tank is situated in the floor near the draw furnace.

Seven additional heat treating furnaces in sizes of 10 x 16, 12 x 16, and 10 x 22 ft, are situated at the north end of the core room. All furnaces are equipped with automatic temperature controls.

Heat treating procedures involving annealing, normalizing, drawing, and quenching, depend on alloy, type of casting, and customer specifications. The procedure generally involves bringing the castings to temperature, holding that temperature for 1 hr per inch of maximum section size, then cooling in a manner to achieve the desired metal properties.

Pattern Shop — All patterns not furnished by customers are made in the company's new, 60 x 120-ft, modernly equipped shop. Wood, metal, and plastic patterns are used. The rigging of patterns supplied by customers, pattern changes, and repair work also are done here.

A small aluminum foundry is incorporated into a 20 x 60-ft room at one end of the patternmaking building. Production patterns are produced in hand-rammed, green sand molds. Two small gas-fired crucible furnaces supply the metal. Aluminum pattern production is a one-man operation.

Metallographic study of metal structure is part of company's quality control program

● For an extra copy of this article, until supply is exhausted, use card on Page 53

All patterns not furnished by customers are made in the company's well-equipped shop situated in a new building near the main foundry building

Safety Measures With . . .

RESINOID CUP

Results of tests on resinoid cup grinding wheels equipped with various types of safety devices are presented, and a number of safe grinding practices to prevent accidents are suggested

● DUE to the extremely rough treatment given to resinoid cup wheels in snagging operations, safety devices such as safety rings and special mounting nuts frequently are placed in the cup by the grinding wheel manufacturer. The exact function and value of these various protective measures are often questioned and misunderstood.

Safety Rings—For example, it is commonly felt that safety rings are placed in a wheel to reinforce it. This is not true. A grinding wheel as manufactured is designed to withstand normal usage and does not require a safety ring. Further, the ring *does not* appreciably increase the ultimate breaking speed of a sound wheel.

To illustrate this second point, several very soft 6-in.-diam, Type 11 resinoid cups with safety rings were speed tested by increasing the number of revolutions until the wheels flew apart. The destruction speed was 9600 rpm. Similarly, a set of wheels of the same size and grade, but with no safety rings, was speed tested to destruction. These wheels flew apart at 9450 rpm. Obviously, there is no appreciable difference in the breaking speed, which indicates that a safety ring does not prevent wheel breakage or greatly strengthen a sound wheel.

It should be emphasized that the grade used in this test was very soft (A16-17-B1) — much softer than normal cup wheel grades for snagging. This grade was used to insure that the test wheels would break below the speed tester limit of 13,000 rpm. Conventional 6-in. cup wheels have breaking speeds substantially above this speed and could not have been broken in the test.

If the ring will not greatly increase the breaking speed of the wheel, the question naturally arises, what is the real purpose of safety rings? The breaking speed of sound wheels is far above the operating speed of 6048 rpm; therefore, a safety ring should not be required. However, grinding wheels often are subjected to very rough treatment and sometimes abusive action. If handled carelessly and dropped or bumped, it is possible for a wheel to become cracked. When this occurs, the wheel will fly apart unless rein-

Fig. 1—The test unit, below, capable of spinning wheels at 13,000 rpm, was used to determine the revolutions at which wheels broke. A test wheel is shown in place

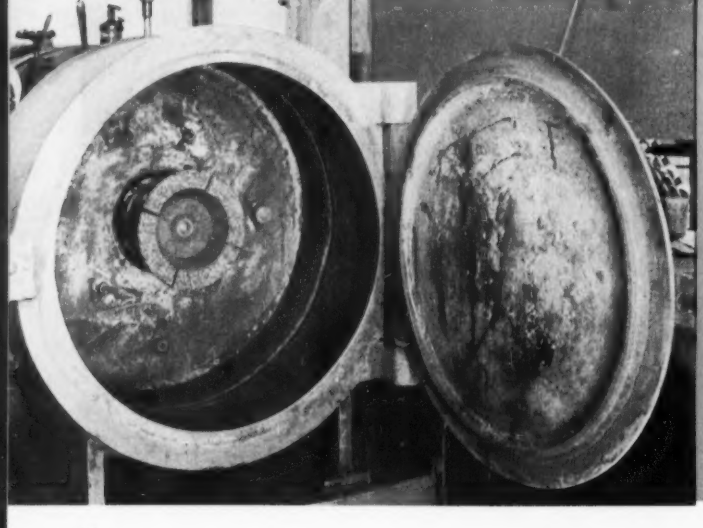
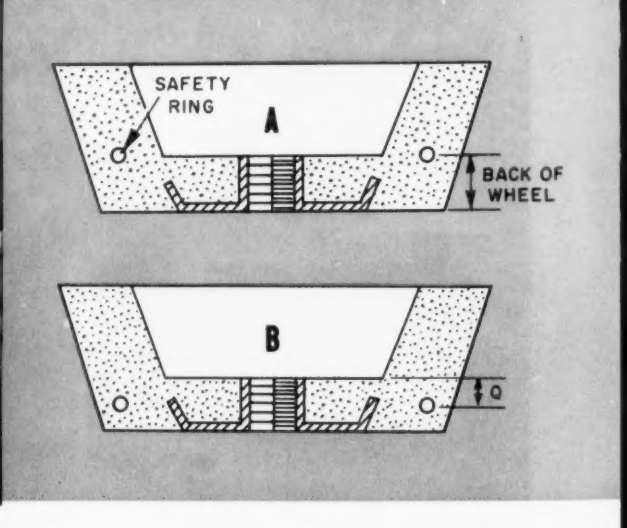


Fig. 2—View A shows safety ring at top of back of wheel. View B shows increased amount of usable abrasive available by placing ring in the middle of the back



GRINDING WHEELS

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forced through some mechanical method. Safety rings provide this reinforcement.

Since the safety ring is placed in the wheel to prevent pieces from flying apart, exactly how effective is it? To determine this, a series of 6-in.-diam, Type 11 cup wheels was tested. These wheels had a 4½-in.-diam safety ring situated in the top of the back position (see Fig. 2-A), and were purposely cracked by slotting the rim and cracking the back (see Fig. 3). Fig. 1 shows the speed tester used for these trials, with a slotted and cracked wheel mounted in the machine and ready for testing.

When speed tested to destruction, the wheels flew apart at 6200 rpm, compared with 3300 rpm for a similar wheel containing no ring. Since 6200 rpm exceeds the operating speed of 6048 rpm, a safety ring positioned in the top of the wheel back will retain the broken pieces should the wheel become cracked.

Effect on Wheel Life—As can probably be seen by comparing Fig. 2-A and 2-B, however, the life of the wheel is limited by placing the ring at the top of the wheel back. Some users like to wear the wheel away until a portion of the back has been used. Because of this, customer demands require that the ring be placed in the middle of the back, which results in longer wheel life.

A test of a cracked wheel (same method as with previous wheel), with the ring in the middle of the back, showed that the "fly-apart"

Fig. 3—A cracked wheel condition was created by slitting the face of the wheel at four points around the periphery and cracking the back

speed was 5400 rpm. This speed, however, is not above the normal operating speed of 6048 rpm, and means that such a cracked flaring cup would fly apart if used.

Although such a condition is not desirable, it is not as unsafe as it might at first seem. A wheel of the same description as above was used until approximately 30 per cent of its usable abrasive was consumed. At this point it was slotted, cracked, and speed tested to destruction. The "fly-apart" speed was 6200 rpm—indicating that after a portion of the wheel is used, its "fly-apart" speed increases. The longer a grinding wheel is used, the less material must be retained by the ring; therefore, the more effective the ring becomes as a safety feature (Fig. 4).

The significance of this circumstance may not be evident until it is realized that the longer a wheel has been in use, the greater are the chances that it has been abused. Also, as the rim is worn away, the remaining wheel is easier to crack because of the reduced thickness. These cracks develop most commonly from careless dropping or throwing of the portable grinder onto the floor, table, or other hard objects.

Another cause of cracking, results from removing one wheel from a grinder to mount another of a different type, setting the first wheel aside for later use. If the wheels then are not placed in safe storage, there is the chance for the wheels to be bumped or knocked to the floor and cracked without the operator knowing about it. Under these conditions, safety rings provide the added protection that is required.

Damage to cup wheels can produce a variety of types of cracks.

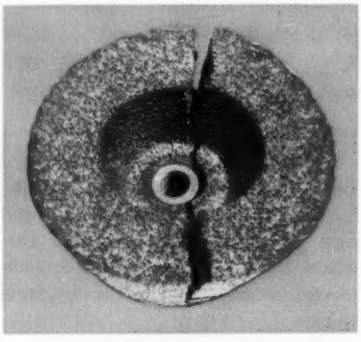


Fig. 5—This wheel, cracked on the diameter, did not fly apart but vibrated excessively

The exact location and extent of such cracks will partially determine the "fly-apart" speed. For these tests, the slotting of each wheel at 90° points around the periphery, and cracking across the back, created a very severe condition.

A good example of a less severe test is a crack across the wheel which runs on a diameter, such as is shown in Fig. 5. Some wheels of this type flew apart at approximately operation speed, but others (Fig. 5) did not fly apart but became so out of balance the speed tester had to be stopped.

What Diameter Ring?—Does the diameter of the ring used in a resinoid cup materially affect its retaining action? To answer this question, a number of 6-in. resinoid cups (Type 11) with 3, 3½, and 4½-in. safety rings were manufactured. These rings then were slotted as described previously, and the backs cracked to simulate a cracked wheel condition. Fig. 6 shows the results. The "fly-apart" speed for the wheel with a 3-in. ring was 2000 rpm, while the speed for the wheels with the 3½ and 4½ rings were 4300 rpm and 5400 rpm, respectively. So the larger the diameter of the safety ring, the greater its holding action.

Other Safety Measures — Since many cup wheels are mounted directly on the threaded machine spindle, it is necessary that a threaded insert be molded in the wheel. The types generally used are either threaded prong-anchor bushings (commonly called flanged bushings) or hexagonal nut inserts (Fig. 7).

To determine whether there is any safety advantage in the use of either, wheels containing each type of mounting were speed tested to destruction after deliberately being cracked. The "fly-apart" speed of the flaring cup wheel with the hexagonal nut insert, in combination with a 4½-in. ring in the middle of the back, was 4900 rpm. The "fly-apart" speed of the same wheel with a prong-anchor bushing was

Fig. 4—Effect of wheel wear on the "fly-apart" speed of cracked cup wheels. A 4½-in.-diam ring was used with type 11 wheels. Rings are more effective as wheels wear

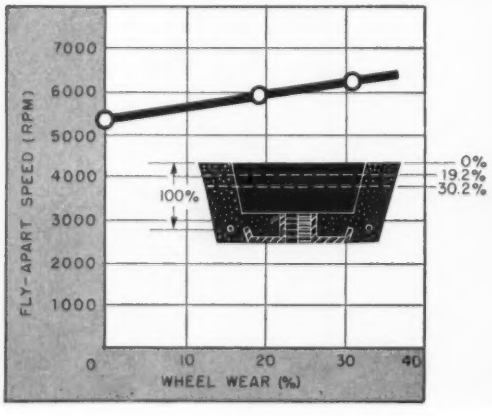
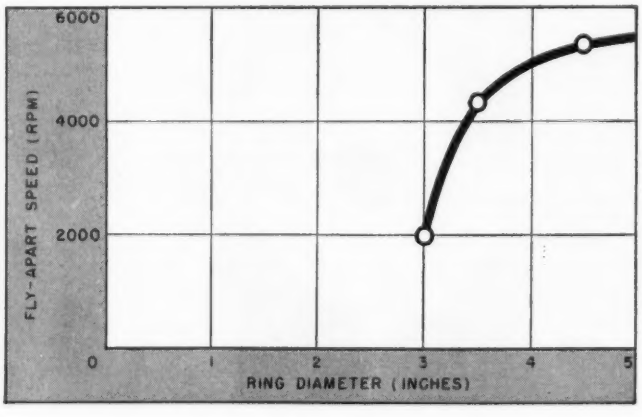


Fig. 6—Effect of 3, 3½, and 4½-in. safety rings on "fly-apart" speed of cracked, 6-in., type 11 cup wheels. The larger diameter safety rings have greater holding action



5400 rpm. Although the difference is not great, it does mean that, since the "fly-apart" speed of a wheel under these conditions rises as it wears, the "fly-apart" speed of a wheel with a prong-anchor bushing will equal operating speed (6048 rpm) with less wear than a wheel which has a hexagonal nut. This design, therefore, provides greater safety.

Rotating Cup Guard—Another safety measure that is used sometimes is the rotating cup wheel guard (Fig. 8). Tests with this guard showed that an *unused wheel*, which had been purposely cracked and contained a safety ring and flanged insert, flew apart at 7000 rpm when speed tested. This result indicates that with such a combination, a high degree of safety is achieved.

Although the rotating type guard provides increased safety, the type of insert used and safety ring are still important. Table I shows the results of tests made on three Type 11 cups in conjunction with the rotating type guard. In each case the wheels were slotted and cracked purposely across the back for the test. These results emphasize the additional safety provided by the ring, even when the rotating guard is used.

This point also was illustrated in another test wherein a rotating guard was molded as a part of the wheel; no ring was used. These wheels when slotted and cracked had a "fly-apart" speed of 5100 rpm.

Table II lists all of the variations in the type of insert used, ring diameters, ring location, and use of rotary cup guard. The data indicate clearly the increased safety achieved with the use of these safety devices. The safest combination shown is that of the prong-anchor bushing, 4½-in. ring, and the rotating cup wheel guard.

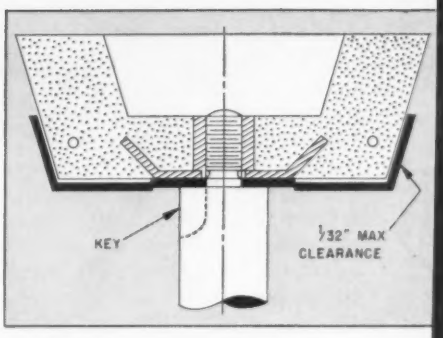


Fig. 8—Cross-sectional view shows a flaring cup wheel and a rotary cup guard assembled

Fig. 7—Two types of threaded inserts—hexagonal nut, left, and pronged-anchor, right—are molded into cup wheels

TABLE I—"Fly-Apart" Speed of Cracked Cup Wheels in Rotating Guard

Type of Insert	Ring Diameter	Position of Ring	Breaking Speed
Hexagonal nut	3½"	Middle of back	5300 RPM
Prong-anchor bushing	None		6200 RPM
Prong-anchor bushing	4½"	Middle of back	7000 RPM

TABLE II—Summary of Effects of Safety Features in Cup Wheels
(All Wheels Cracked—Full Thickness)

Type of Insert	Ring Diam	Ring Location	Others	Fly-Apart Speed, rpm
Prong-anchor bushing	4½"	Top of back	Rotary cup guard	7000
Hexagonal nut	4½"	Top of back	None	6300
Prong-anchor bushing	None	None	Rotary cup guard	6200
Prong-anchor bushing	4½"	Top of back	None	6200
Prong-anchor bushing	4½"	Middle of back	None	5400
Hexagonal nut	3½"	Middle of back	Rotary cup guard	5300
Wheel molded in Rotating guard	None	None	None	5100
Hexagonal nut	4½"	Middle of back	None	4900
Prong-anchor bushing	3½"	Middle of back	None	4300
Prong-anchor bushing	3"	Middle of back	None	2000

The Importance of Safety—None of the features mentioned here should be considered as offering absolute safety. Although safety rings, prong-anchor bushings, and rotating cup guards provide added protection from a wheel flying apart after cracking, it is still possible, though rare, for a chunk of the rim to be broken out of the wheel and to fly off. The cracking of the wheel back is by far the most common type of hazard, and for this reason the safety devices discussed here are the most important.

In no case is there a substitute for safe grinding methods as a guard against the various accidents which can occur. This is particularly true with rough grinding operations, where the heavy-duty nature of snagging work increases the opportunity for the grinder operator to lapse into careless and abusive handling habits. Here are some points to keep in mind:

1. Watch work habits closely so as to use the safest methods of grinding at all times.

2. Inspect wheels prior to use for damage. Wheels known to be cracked should never be used.

3. Use the safest possible equipment, guard, etc., and maintain them in proper condition.

4. Use cup wheels with adequate safety features.

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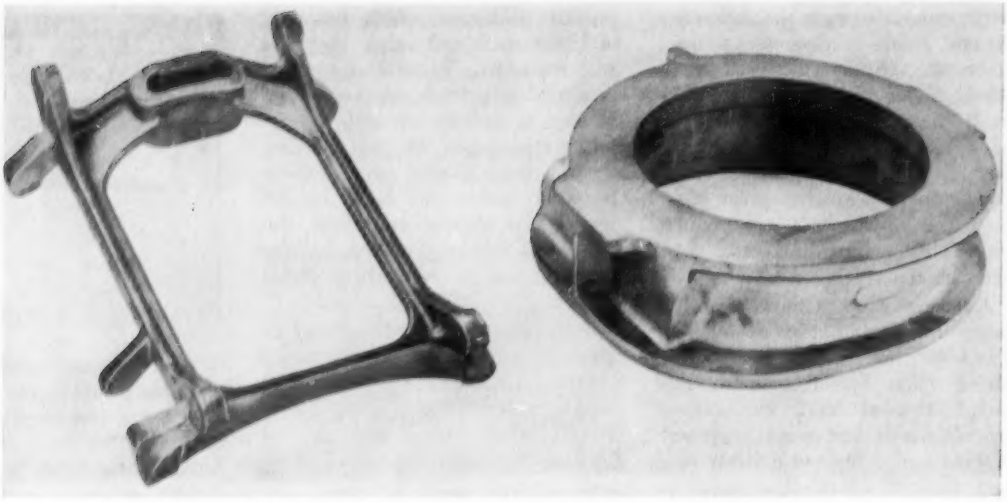

Fig. 1 (left)—Frame cast of high-carbon steel in ceramic mold. Fig. 2 (right)—This 60-lb stainless steel flange casting was molded with wooden pattern equipment

Ceramic Mold Process

Offers Improved Casting Properties

For certain uses ceramic-mold castings provide good metallurgical properties, surface finish, and dimensional accuracy. Pattern equipment needed is simple

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● CURRENT demand for improved casting quality has resulted in development of a wide selection of production processes.

But aside from certain techniques which essentially are applicable only to the nonferrous founder, those designed for iron or steel castings generally fall into two major categories: 1. Sand improvement methods. 2. Specialized processes.

The first group covers broadly all techniques which allow the use of conventional sand foundry equipment; casting improvement is achieved by sand variation and control, mold facings, etc. To some extent, it also includes methods of a more diverse nature, such as the CO_2 process.

The second category refers largely to the wide range of precision casting processes which, normally, use a layout and production system different from that employed in the conventional sand shop. Among these processes are shell molding, investment casting, and certain others.

The Unicast Process, the subject of this article, is best defined as fitting between both categories. It is a method more closely achieving the result expected from precision casting, yet it can be operated in almost any sand foundry layout or toolroom. Aside from a few minor items, very little specialized equipment is required.

All of the usual ferrous and nonferrous alloys, including the superalloys, can be cast by this method. Most current work is with carbon and alloy steels, including stainless. Steel castings up to 300 pounds

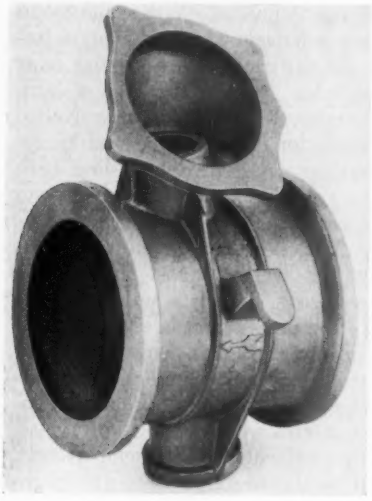


Fig. 3—Stainless steel valve body weighs 14 lb. Ceramic molding aided casting soundness and cut machining

in weight have been produced successfully. While there is no theoretical limit to the weight of an individual casting which can be made, mechanical handling would become increasingly troublesome on weights of more than about 1000 pounds.

Ceramic Molding Medium—The basic difference between this process and sand or shell molding is the use of poured ceramic slurries instead of dry sand. Of prime importance is the fact that simple pattern equipment can be used throughout. Special types of tooling are not required.

To more effectively broaden the scope of the process, two types of ceramic molding material can be used. The first is employed on restricted applications, such as cast tooling and die cavities, where extremities of tolerance and surface finish are required. On small parts —up to 2 in.— tolerances of ± 0.003 in. are obtainable, rising gradually to ± 0.010 in. as the size increases. Surface finish generally is in the order of 60 to 80 microinches, depending on the alloy being cast.

The second ceramic variation is somewhat less expensive and is used on more general foundry applications where it becomes closely competitive with sand or shell molding. There is obviously a slight reduction in tolerance and surface finish, but the results are considerably superior to that expected with either one of the other two methods.

This new process goes a long way towards minimizing cost and control problems. Production costs become realistically low and process control more routine. Several West Coast foundries are using it on a production basis, both for tool and die applications and regular jobbing. In the latter instance, some current users claim their savings in finishing labor alone far outweigh any increased material cost. Though the process has only recently become available for general use, two large-scale jobbing shops have found it advantageous to convert their entire sand foundry operations to it.

Pattern Life Extended—As mentioned earlier, almost any type of inexpensive pattern equipment can be used. One interesting aspect is that pattern life is greatly increased, largely due to the smoothness of liquid slurries as opposed to the abrasive effects of dry sand.

Direct molding labor is about the same as for sand but the elapsed time factor is somewhat greater, mainly because the slurry must have a few minutes to set before stripping. This slight delay is of little consequence where several patterns can be run simultaneously, but shops producing long runs from single patterns probably will find a duplication of pattern equipment necessary to cut down the elapsed time cycle. Inexpensive epoxy duplicates have proved ideal for this purpose and have shown a duty life of several thousand cycles when used with the slurries.

Cores are made from the same ceramic slurries, but with slight deviations in procedure. As with pattern equipment, any type corebox can be used—wood, metal, plaster, epoxy, etc. Core support inserts rarely are necessary, even in the case of fairly long blind sections, since the ceramic is adequately firm. This characteristic is not applicable to crushing strength, and hot tear problems thus are seldom encountered.

Occasionally a job will require smooth, intricately cored passages but the exterior sections are of no real consideration. Valve bodies, pump, and fluid-flow components frequently seem to fall into this category. In such cases the ceramic materials can be employed solely for the cores, which would then be set in sand or shell molds for casting. One impeller manufacturer using this method claims a 60 per cent increase in pump operating efficiency because of the smooth as-cast surface on cored internal passages. With sand cores, rougher surfaces had previously been mandatory since the internal complexity made finishing almost impossible.

Ceramic Plus Binder—Molding slurries are made up in the foundry by mixing a selected blend of fine-grained ceramic materials with a slightly viscous liquid binder. A feature of the process is the incorporation of chemical additives to the dry mix which become partially eliminated during the subsequent processing cycle; the voids thus created account for the desirable crushing strength and relatively high permeability of the finished mold.

The liquid binder is either of phosphate origin or a modified aqueous colloidal sol although, in some instances, similar organic binders are employed. The choice of binder will depend on the type of work being produced. The actual slurry has a pouring consistency of heavy cream. Setting times will depend on foundry requirements and are made fully adjustable by controlled additions of a catalytic reagent.

In actual molding practices, the ceramic storage bins and liquid binder tanks are mounted directly above the mixing equipment. Simple hopper and valve devices insure accurate feeding of required quantities. On a production setup, the mixer also functions as the molding station, with flasks being transported to it on a conveyor. This arrangement makes it possible to pour a large number of molds from one mixing charge. The smaller foundry will prefer a simpler operation and probably will hand pour no more than four or five molds at one time.

Production Rate Varies—Production rates vary according to the job being run; size, complexity, and coring all are determining factors. To secure the greatest efficiency, certain operations requiring direct labor—such as weighing out of ingredients, pouring of slurry, strip-

Fig. 4—Cutaway section of pump impeller. Interior surface smoothness raised efficiency of pump materially

ping, and assembly—must be coordinated with elapsed time functions requiring no such labor—for example, mixing and setting. More simply, while the first batch of molds is finally setting, the weigh-out for the next batch is taking place. Similarly, while the first batch is being stripped and assembled, the next batch of slurry is being mixed.

Using this sequence, the part shown in Fig. 1 gives a typical example of production rates in a small foundry. Four mold halves are poured at the same time. Stripping and assembly to form two complete molds takes 4 minutes. An additional 3 minutes is consumed in the other direct labor functions, weigh out, and pouring. This gives a total of 7 minutes to produce two molds, or 3½ minutes each. One unskilled man, following a set procedure, performs the entire operation.

Where simpler molds are being produced, several small shops have found women operators to be quite satisfactory. Going to the other extremity, it is not difficult to imagine the speed increase possible in a large-scale mechanized shop.

Once assembled, the completed mold sections are "locked." This is a unique feature of the process which allows for shape and dimensions to be stabilized as molded; the tendency to cracking, distortion, or sectional warpage of large flat surfaces is greatly minimized, thus reducing any parting line irregularity. Where a continuous production line is employed, the locked molds may continue to the firing stage. In smaller foundries it may be desirable to build up a stock of molds so that a batch can be fired together; there is no necessity to fire the molds immediately.

Curing the Mold—Firing, or curing, can be accomplished in three different ways. The first method would more correctly be described as a drying operation and is suitable only where nonferrous metals are being cast. The molds merely are heated at about 400° F for two or three hours in a regular type core oven prior to pouring.

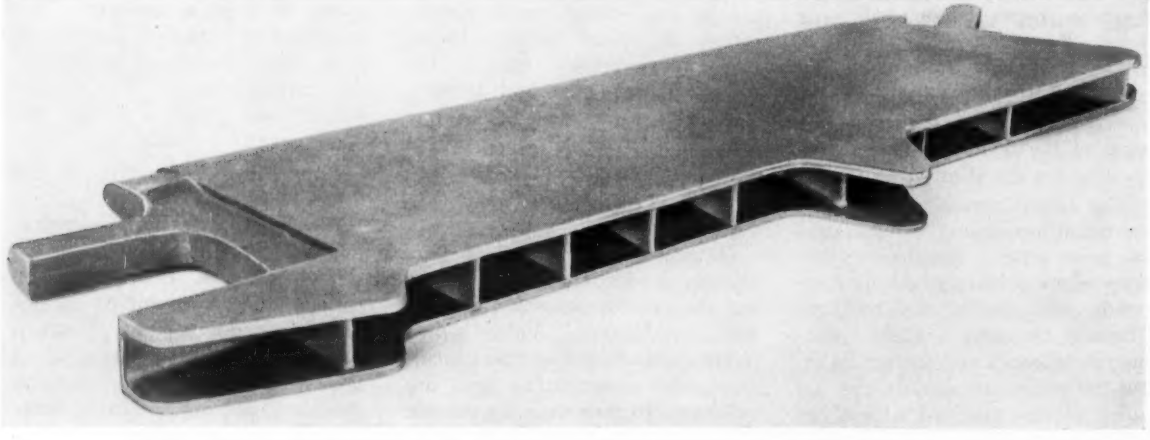
With high-temperature alloys, a more direct form of curing is essential to obtain fully the ceramic conversion. This operation can be achieved either in an oven (muffle furnace), or by a specialized skin-firing technique. Where the molds are relatively small, the oven furnace generally will be found more suitable. Almost any type of heat-treating furnace can be converted easily for this work. Foundries operating on a production-line basis may even prefer to use a conveyor type furnace.

The skin-firing method is employed where utmost simplicity is required. This is a unique feature of the process and is especially useful in producing large or heavy molds since it eliminates the mechanical handling problems encountered when dealing with a massive bulk at elevated temperatures. It is also of value when the quantity of molds in progress is too few to warrant running an entire oven.

Using this method, a high-pressure gas flame is played into the mold cavity for a short duration—in fact, just long enough to cure a predetermined skin depth. The thermal properties of the mold materials are such as to preclude the cracking or warpage which might normally be expected when similarly treating other types of refractory. A further advantage of this method is that certain sections can, if desired, be superheated so as to allow greater control of directional solidification.

Casting—The next step, of course, is casting. Molds removed from the oven are transported to the pouring station or, if necessary, allowed to cool and stored until required. Skin-cured molds can be cast stationary once the hinged fir-

Fig. 5—Stainless steel stabilizer vane cast in ceramic mold using epoxy matchplate and plaster coreboxes. Part is nearly 2 ft long



ing assembly has been swung away.

Actual pouring techniques are not covered in this article since they need differ little from conventional practice. Mold permeability, however, is great enough to allow fairly short heads of metal and a low pouring height. Very little static pressure is required to fill completely even the thinnest cavities since there is no appreciable back pressure from entrapped air.

The mold structure is totally inert when fired, and there is complete freedom of gases normally injurious to solidifying metal. Likewise, metal/mold surface reactions seldom are encountered. Investigation currently is under way with another phenomenon peculiar to this process in that certain steel alloys which frequently are subject to surface oxidation during cooling, apparently exhibit far less of these tendencies. By going one step further and cooling in neutral environment chambers, surface oxidation appears to become almost totally eliminated.

Knockout of the mold is relatively simple and, in most cases, there is a clean breakaway of mold material from the casting. Light shotblasting will remove any remaining ceramic from inaccessible cavities. Vapor blasting may be preferred where absolute casting definition must be maintained, as in tool and die applications.

Can Be Integrated—Summarizing the processing technique, it will readily be seen that most foundries can utilize or convert to this process without much modification of existing equipment. Although an independent production line obviously is to be preferred, there is no real economic disadvantage in a setup where the process is integrated with say, a sand operation, and is used only on a limited basis. The determining factor in whether to combine or separate the line is solely one of volume requirements, variable for each individual foundry.

In the case of tool and die shops, or any other business not normally engaged in foundry production, the equipment requirements are so nominal that the entire installation can be tucked away in a corner of the shop without difficulty. The majority of shops in this category seldom would operate their facilities on a continual production basis, but probably would use the installation only as specific applications arise.

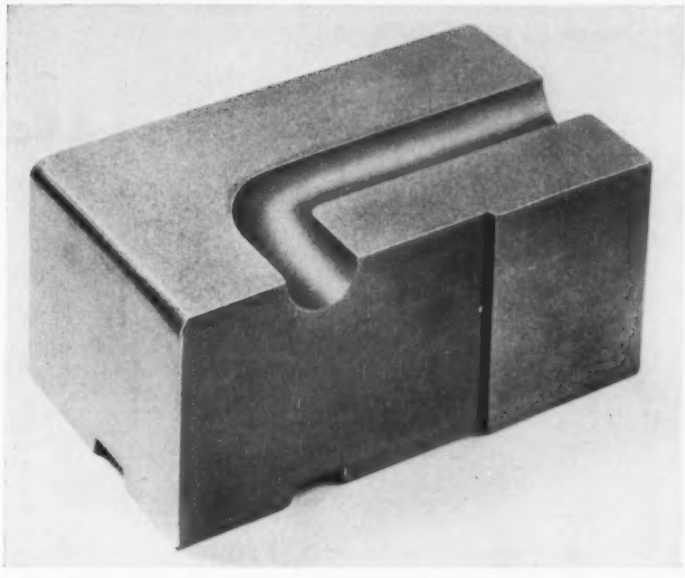


Fig. 6—Tool steel section of a forming die was cast at one-third previous machining cost. As-cast tolerances ± 0.003 in. Less than 0.001 in. stock removal needed to obtain high polish in the cavity

Although it is difficult for cast tolerances to compete with the critical limits obtainable on close machining operations, the amount of finishing, if any, is so greatly minimized compared with working from blank or sand-cast stock, that an extremely wide scope of economic applications becomes available. The type of castings produced will usually be dies for plastic, glass, or rubber molding, die-casting, etc.; hobs, extrusion dies, and countless others.

Aside from the fundamental benefits already discussed, such as surface finish and dimensional accuracy, several other aspects have important values. The greater control of directional solidification coupled with increased permeability obviously will improve metallurgical properties and design flexibility. Pattern equipment too can be simplified.

The question of design freedom opens an entirely new field for consideration. Massive sections frequently can be cast with a minimum of risers, thus eliminating many obstructions for the designer. Thin sections also present no great problem; thicknesses down to 1/16 in. have been produced over fairly large areas—and even somewhat thinner in smaller sections—without too much difficulty. Almost the same applies to sharp edges and rapid sectional changes. Fillets and ribs usually cannot be eliminated completely, but they can be reduced considerably.

The cast structure is extremely fine-grained and lacks the coarseness frequently associated with sand castings. Inclusions, too, seldom are encountered. Many castings produced to date have been for aircraft or hydraulic applications where pressure tests and other physical requirements generally are severe.

Several foundries report their scrap losses from defects disclosed only by x-ray to be desirably low. Test bar data show evidence of properties comparable to those of investment castings; some tensile and elongation figures have been outstanding.

This process is available for use under a simple licensing arrangement with the Unicast Development Corp., Box 325, Yonkers, N. Y. (This organization is connected in no way with the Unitcast Corp., Toledo, Ohio, steel foundry.—Ed.)

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Vacuum Arc Melting and Casting of

TITANIUM

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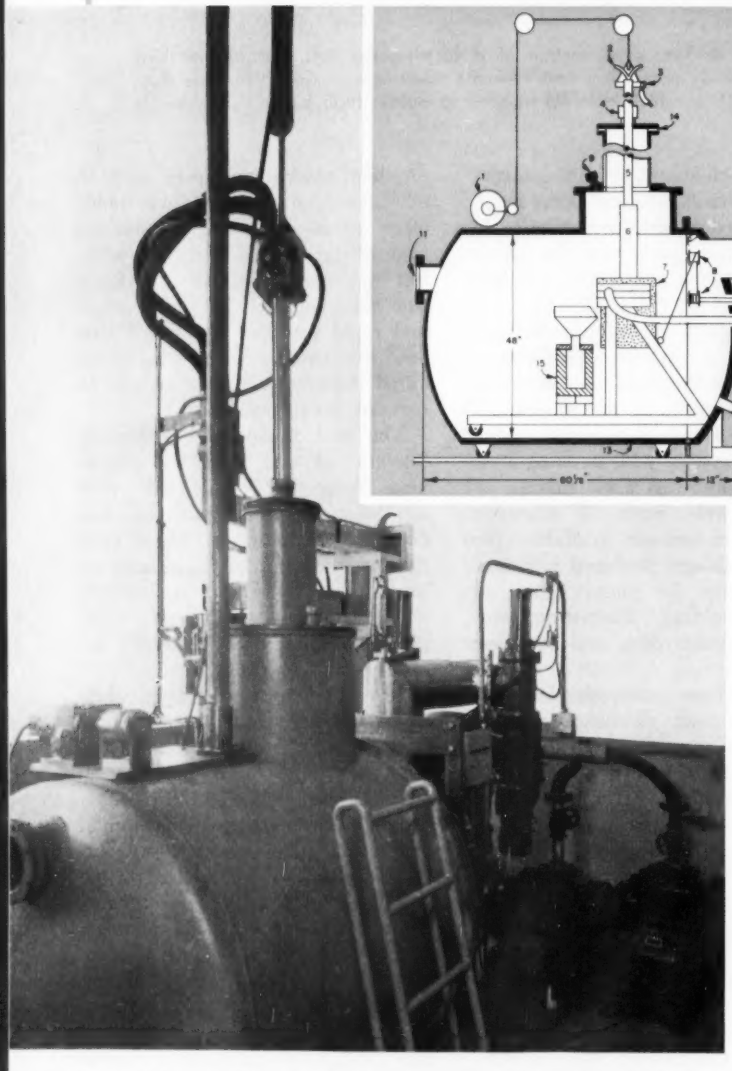

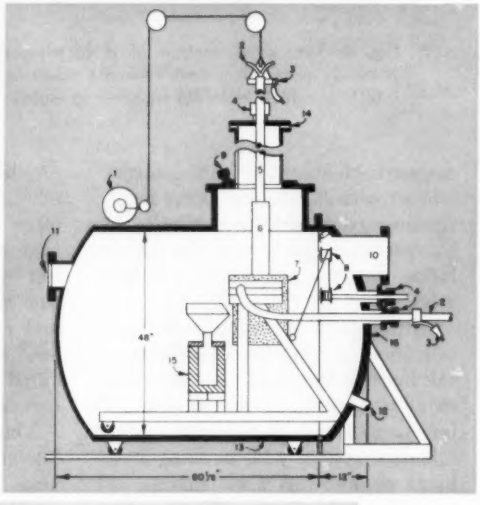

Fig. 1 (above)—View of the Naval Research Laboratory skull furnace and its associated equipment. It is basically of the U. S. Bureau of Mines design. Fig. 2 (top right)—Schematic diagram of important features of skull furnace

● DEVELOPMENT of titanium as an important structural metal has been exceptionally rapid. Programs of research and development conducted in the last decade under federal sponsorship and subsidy provided the impetus for its accelerated development. The concentrated effort by government and industry has resulted in a well established titanium industry capable of supplying a wide variety of wrought products.

The field of titanium casting has not, however, been developed to any extent, although limited research conducted by government and industry indicates that a sound metallurgical basis exists for such development. The lag may be attributed to the limited research and to the technical difficulties associated with the melting and casting of this high-melting, highly reactive metal. These operations require the exclusion of air and other deleterious gaseous contaminants.

Molten titanium reacts with all of the common gases except helium and argon, and it is capable of dissolving large amounts of oxygen, nitrogen, hydrogen, and carbon. Contamination by any of these elements, even in small amounts, tends to embrittle the metal and to destroy its desirable mechanical properties.

This article is the first of two which will describe results of Naval Research Laboratory investigations of the feasibility of vacuum arc melting and casting of titanium. A skull furnace of U. S. Bureau of Mines design was employed.

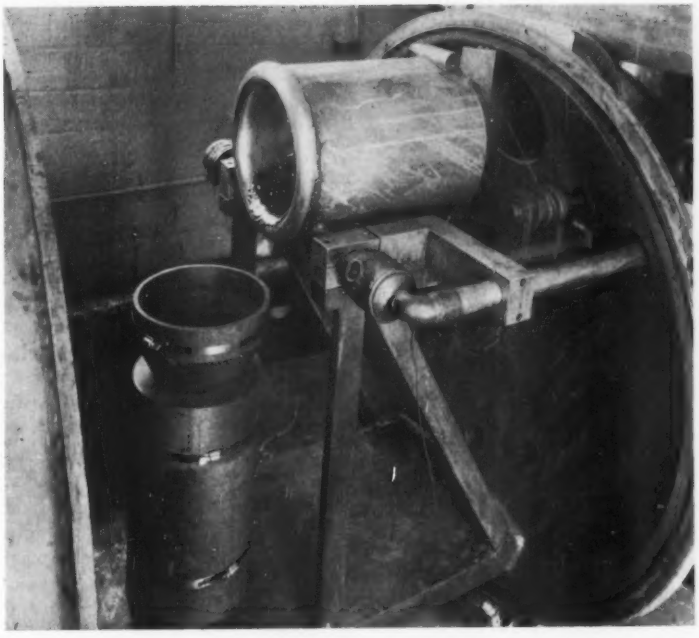

Fig. 3—Crucible assembly of skull furnace, together with its mounting in the furnace, is in tilted position for casting into a graphite mold

Molten titanium also reacts with or dissolves all known refractories. This behavior eliminates consideration of any melting technology based on refractory compounds as crucible materials and has seriously deterred development of casting processes for the metal.

Progress in Melting—Significant progress has been achieved in the development of melting furnace equipment for producing a molten titanium pool of adequate weight for making castings. Of the various types of furnaces proposed and tried, the most promising is the consumable electrode skull melting furnace design pioneered by the U. S. Bureau of Mines Experimental Station at Albany, Oreg.[1]

In this system, titanium is melted under vacuum in a water-cooled copper crucible. Direct current is supplied to the consumable electrode to melt it so rapidly that a large bath of superheated metal is obtained and only a small amount of the melt solidifies adjacent to the walls of the crucible before it is lip poured.

The skull furnace adopted at the Naval Research Laboratory for conducting melting and casting research on titanium is basically of the Bureau of Mines design. Certain modifications and improvements, however, have been incorporated which will be described together with the progress made in the use of this equipment.

The search by various investigators[2, 3, 4] for mold materials that would both avoid contamination of cast titanium and provide the other essentials of casting quality has not been very rewarding. Generally, the extremely corrosive molten metal reacts with conventional mold materials, causing severe contamination and unsoundness in the cast metal.

Graphite resists the chemical action of molten titanium better than any known refractory material, and sound, smooth castings have been produced in machined graphite molds. The use of machined graphite molds, however, has these disadvantages: 1. Contamination of the cast metal with carbon. 2. Thermal conductivity of the graphite, coupled with low specific heat of the metal, introduces problems in controlling metal solidification. 3. Molds are expensive and limited in usefulness.

To overcome the cost disadvantages of machined graphite molds, replaceable inserts of graphite have been employed, and an expendable mold has been developed[5] based on graphite powder bonded with carbonaceous binders and made up with standard foundry equipment and practice. Small, sound castings with good surface finish have been produced with this material, but carbon contamination is greater than in castings made in machined graphite. Precise dimensions are somewhat difficult to maintain with expendable molds because of shrinkage during firing of the mold.

A limited study is being conducted at NRL on graphite and graphitic material to determine whether improvement can be obtained in these materials which would either inhibit carbon contamination in cast titanium or reduce it to a low level.

Temperature Measurement—This is an important factor in the casting of titanium. Without accurate measurement, it is not possible to determine the manner in which titanium solidifies or to analyze and develop the required control of heat extraction in relation to shrinkage problems. It is not known whether the solidification time of titanium castings follows any existing theory such as that of Chvorinov[6] which states that the time of complete solidification of castings made under the same conditions in the same material should be proportional to (volume ÷ surface area).[2]

The effect of pouring temperature variations on the freezing time and mode of solidification may be im-

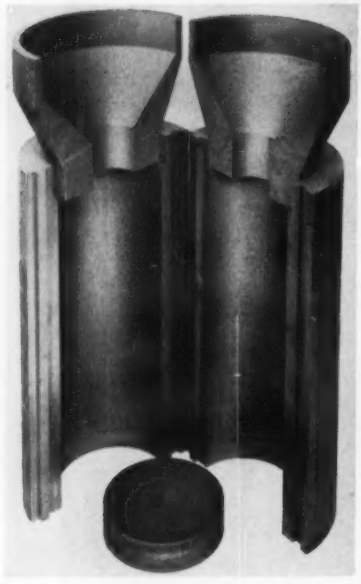

Fig. 4—Top-pour, split ingot mold 6 in. in diam, machined from graphite

portant in casting titanium, although this factor may be difficult to control in the skull furnace system of melting. According to the theory of heat extraction by a mold, freezing times should be a parabolic function of the superheat. It therefore is obvious that development of a technique for accurately measuring temperatures of titanium during casting is essential. This problem is being studied at NRL, and the progress made will be described.

NRL Melting Facility — Three consumable electrode furnaces are in use. One is a cold mold ingot furnace used to melt titanium sponge compacted at 50 tons per sq in. into bars 2 in. square by 20 in. long and welded into a consumable electrode 12 ft long. The resulting ingot is about 6 in. in diameter and weighs about 70 lb. It provides the material for the consumable electrode required in the larger skull casting furnace.

Another furnace is of the skull type. It can be lip poured and has a capacity of about 12 lb of steel. This furnace, obtained commercially, is used for small experimental heats of high melting metals.

The main skull casting furnace, which is to be described, has a capacity of 100 lb of molten titanium which can be lip poured to produce homogeneous titanium ingots or shaped castings. Electrical energy for these furnaces is supplied from a rectified dc power source consisting of eight rectifiers rated at 1250 amp each at 100 per cent duty cycle for a total of 10,000 amp.

The main consumable electrode vacuum arc skull melting and casting furnace installed at NRL is basically of the U. S. Bureau of Mines design.[1]

A view of the NRL skull furnace is shown in Fig. 1, and its important features are illustrated schematically in Fig. 2.

The furnace tank consists of two sections (parts 13 and 16), each of double-wall construction, with cooling water circulating between the walls. The two sections are held together to form a vacuum-tight system by a flanged joint equipped with an O-ring vacuum seal. Section 13 is mounted on wheels and can be retracted to permit access to the crucible and to the mold assemblies. Section 16 is a fixed dished head which supports the crucible assembly from a frame attached to this section. Through it are introduced cooling water, dc power, rotary motions for tilting the crucible, and vacuum ports of 10-in. diam (part 10) and of 2-in. diam (part 12).

The tower which supports the consumable electrode "stinger" (part 5) consists of two sections: 1. A double walled water-cooled cylinder 24 in. in diam by 18 in. high. 2. A single-walled section 12 in. in diam by 18 in. high mounted on top. The consumable electrode "stinger" (part 5) is a water-cooled, extra-heavy copper tube 2⅞ in. OD by about 8 ft long. It is chromium plated.

A titanium consumable electrode (part 6) measuring about 6 in. in diam by about 4 ft long is attached to the lower end of the "stinger," which not only supports the titanium electrode but also provides dc power at negative potential. The "stinger" enters the furnace through a sliding vacuum seal (part 4). Controlled vertical motion for raising and lowering it is obtained through a motorized cable system (part 1).

Water cooling is introduced into the stinger at the water connection (part 2) and power at the power connection (part 3). A pneumatic cylinder (not shown) is attached to the cable system at the top of the stinger. It provides rapid retraction of the consumable electrode to permit tilting the crucible when the melt is ready to pour. The consumable electrode assembly is electrically insulated from the furnace tank and tower by a ½-in. thick Teflon gasket (part 14). Two ports (parts 9 and 11) permit visual observation during melting and pouring, respectively. The pouring funnel and mold assembly location is shown by part 15.

The water-cooled copper crucible assembly (part 7) consists of a ¼-in. thick copper inner container at-

Fig. 5—Typical cylindrical titanium ingots 6 in. in diam cast in a graphite mold

tached to and surrounded by a water jacket. The inner container is tapered from 9½ in. at the bottom to 10 in. at the top and is 14 in. deep. Its bottom, also ¼ in. thick, is attached to the sides by a stepped brazed joint. Its top was spun over to provide a seamless pouring lip, then joined to the water jacket by silver brazing. The inner container and water jacket comprise a watertight assembly.

Water cooling and power are supplied to the crucible assembly through heavy-walled copper tubing, 1¼-in. OD (part 2), and terminal (part 3). The crucible is tilted by a motor-driven cable arrangement (part 8) operating through a rotary vacuum seal (part 4). The crucible assembly in a tilted position, together with its mounting in the furnace, is shown in Fig. 3.

The vacuum system includes one 6-in. oil booster pump with a rated speed of 1100 cfm at 25 microns, and one 6-in. three-stage fractionating diffusion pump rated at 1500 cfm at 1 micron. These pumps are backed by two compound mechanical vacuum pumps with a total rated pumping capacity of 74 cfm (free air displacement) and one holding mechanical pump rated at 2 cfm (free air displacement). Pneumatically operated vacuum valves are arranged so as to isolate the furnace from the vacuum system or to pump through either the booster or three-stage diffusion pump or through both pumps. Thermocouple gages, an alphatron, and an ion gage are used to measure the vacuum.

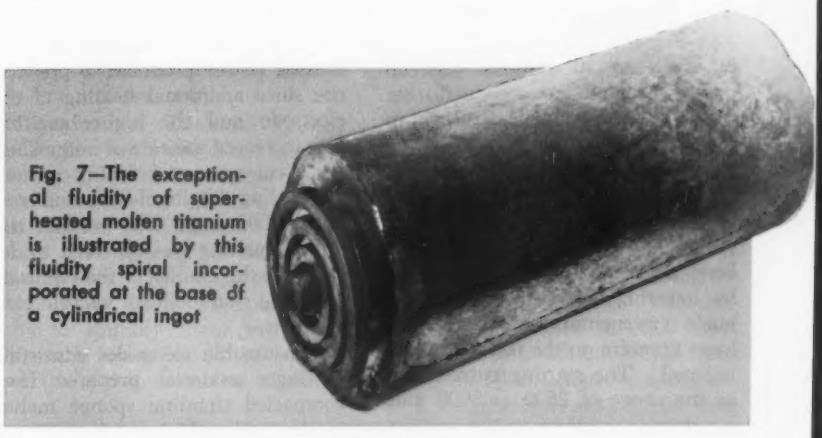

Fig. 7—The exceptional fluidity of superheated molten titanium is illustrated by this fluidity spiral incorporated at the base of a cylindrical ingot

For safety reasons, the skull furnace and its associated equipment is situated within a steel-walled enclosure and is remotely operated from a control panel. Power is transmitted to the furnace by copper bus bars, and current control is obtained at the panel board. Power consumption in the furnace at first was computed from continuous recordings of the arc voltage and current. It was found advantageous to install a dc kilowatt hour meter to give continuous indications of the power consumed. A photoelectric counter indicates on the control panel board the revolutions of the meter disc, and each revolution represents 0.2 kw-hr. This power consumption indicator provides a convenient correlation with the amount of molten metal in the crucible for a given set of melting conditions.

Titanium consumable electrodes used in the skull furnace measure about 6½ in. in diam and up to 45 in. long. They are made up of ingots produced from the cold-mold ingot furnace. These ingots are machined to clean up the splatter shield formed on the sides and to produce flat ends so that they can be attached end-to-end with titanium studs fitted into centrally tapped holes to form a continuous electrode. Heliarc tack welds are spaced around the circumference of each coupled joint to insure adequate strength. With enough operating experience, it is possible to arc weld sections of electrode together within the furnace.

Fig. 6—Typical rectangular titanium ingot cast in a graphite mold

Skull Furnace Operation—When the NRL skull furnace first was placed into operation, limited information was available on the behavior of the melting arc in vacuum, particularly concerning melting of titanium. The general consumable arc melting procedure for titanium employed inert gases such as argon or helium, maintained at partial pressures above 10 mm Hg within the furnace. Below this pressure the arc developed a phenomenon which has been termed a diffuse "glow discharge," but which may be better described as a discrete arc of restricted volume, positionally unstable at a level in the crucible well above where the arc is intended to be. Considering the success of melting molybdenum in vacuum, it was believed that consumable electrode melting of titanium in vacuum would have equal merit, particularly when applied in the skull furnace.

The melting procedure, typical of early trials using unalloyed titanium, may be described as follows. An electrode consisting of ingot material of about 6 in. in diam and weighing about 200 lb was attached to the "stinger" or copper support tube, and a starting pad of titanium or a previously used "skull" was placed in the copper crucible. As much as 20 per cent of the melt can be in the form of titanium charged into the crucible prior to melting. After sealing the furnace system, the mechanical vacuum pumps reduced the pressure within the furnace to 500 microns

in less than 10 minutes. An oil booster vacuum pump then further reduced this pressure to 1 micron in an additional 5 minutes.

After necessary water and power connections had been made and the flow of cooling water to the various parts of the furnace had been adjusted, the arc was ignited by lowering the electrode until it made momentary contact with loose titanium on the titanium starting pad. The starting current was in the range of 2500 to 3000 amp

Fig. 8—Typical cast microstructure is shown by this longitudinal section cut from rectangular cast ingot

dc with the consumable electrode (cathode) at negative potential. The arc voltage drop was maintained close to 30 volts by controlling the rate of electrode feed.

As soon as melting started, the pressure in the furnace dropped to below 1 micron as a result of the "clean up" or "gettering" action of the titanium vapor on residual gases within the furnace. When arc stability was obtained, the power was increased in 500-amp increments to a maximum of 9000 amp, depending on the weight of melt and the superheat required. Increased power produced a pressure rise since additional heating of the electrode and the higher melting rate increased the rate of outgassing. Peak current for finishing a melt for casting 80 lb of titanium was about 9000 amp. The pressure rise during melting was observed to depend on the quality of the electrode from the standpoint of volatile constituents.

Consumable electrodes consisting of ingot material prepared from compacted titanium sponge melted in the cold-mold ingot furnace under a partial pressure of 50 mm of inert gas mixture (80 per cent helium and 20 per cent argon), were noted to contain considerable dissolved gas. When melted in the skull furnace, this material produced a pressure of about 100 microns at the completion of the melt.

Use of a better quality of commercially pure titanium sponge and outgassing the compacted titanium at a vacuum of 0.01 micron and a temperature of 500° F prior to melting at a partial pressure of 10 mm Hg reduced the amount of gas retained in the titanium. When this ingot material was melted in the skull furnace, peak pressure at completion of the melt was less than 10 microns.

Consumable electrodes consisting of ingot material prepared from titanium vacuum cast in the skull furnace and re-used as electrodes showed further reduction in the amounts of gas retained by the metal. Melting at pressures below 1 micron required additional pumping time, however, to reduce the pressure within the furnace to a low level prior to the start of the melting cycle.

The vacuum system had to be augmented by the use of a three-stage fractionating diffusion pump in addition to the oil booster pump. When the diffusion pump and booster pump were operated in parallel, pressure was reduced to below 0.1 micron in about an hour. When the skull furnace was pumped overnight with the diffusion pump backed by a mechanical pump, pressure was reduced to below .01 micron. With cold trapping, pressures as low as 0.005 micron have been obtained prior to start of melting.

No difficulties have been experienced in igniting an arc at these low pressures using 2500 amp as starting current. Since no inert gas was employed and the ambient residual atmosphere within the furnace was air, it has been concluded that the arc does not require any permanent gas for its support, but can be maintained entirely on metal vapor derived from the electrode and/or the molten pool.

When the arc was ignited in this low-pressure range, there was no indication of the "gettering" action by the titanium as noted at the higher pressures. The melting proceeded

Fig. 9—Gross shrinkage was eliminated by increasing size of riser, as shown in this longitudinal section

smoothly, with the pressure rising to only about 0.5 micron at the completion of the run while melting over 10 lb of electrode per minute.

Notwithstanding published data reporting the vapor pressure of titanium to be 3.5 microns at the melting point, vacuums of 0.1 micron have been maintained in the furnace chamber during melting and casting. This observation indicates that published values of the vapor pressure of titanium may be too high. The pressure within the arc region is, of course, considerably higher than 0.1 micron. The vacu-

um conductance of the circular annulus between the electrode and crucible is, however, quite large (calculated to be in the order of 1500 liters per second at about 0.1 micron). Thus a rather large pressure gradient must exist in close proximity to the arc itself. Aside from a small amount of spatter, very little titanium in the form of vapor escapes from the crucible. Since the titanium vapors are shock cooled and retained in the crucible, they must be considered as a potential high vacuum pumping source.

Melting Efficiency—It is convenient in this instance to express the efficiency of consumable electrode vacuum arc melting by the total electrode burn-off per unit of electrical power at a given pressure level. The melting of compacted titanium sponge into ingots in the cold-mold furnace yielded approximately 2.2 lb of titanium per kw-hr at the 10-to-50-mm pressure level.

Skull furnace melts yielded up to 2.6 lb per kw-hr at the 50-to-100-micron pressure level and 2.9 to 3 lb per kw-hr at the 0.5-micron pressure level. Yields up to 3.6 lb per kw-hr were measured in some melts at 0.5 micron where up to 20 per cent of the furnace charge was made up of loose pieces of titanium placed in the skull prior to melting.

Theoretical estimates of the power required to melt titanium are in the order of 0.21 kw-hr per pound or 4.8 pounds per kw-hr. Under a given set of melting conditions, decreasing the pressure to below 1 micron increases the efficiency principally by decreasing heat loss from gaseous conduction. The major benefit resulting from this effect is an increased depth of molten metal pool.

The yield of molten metal available for casting depends on the heat balance, which can be varied widely. The yield may be expressed as the ratio of cast metal weight to retained skull weight. Out of a total of 125 lb of metal melted, about 45 lb or 35 per cent will be retained in the crucible as a skull. Once formed, this skull may be reused and successive melts made, and over 95 per cent of the metal melted can be cast. Starting a melt in a thick skull using a high current such as 3500 amp and increasing this rapidly to 8500 amp for the duration of the melting cycle has resulted in a decreased skull weight at the end of melting and a yield of over 100 per cent.

Experimental Titanium Casting—The first use made of the vacuum arc skull furnace installation was to cast homogeneous unalloyed titanium ingots. Machined graphite molds were selected for the experimental work. The molds measured 6 in. ID by 14 in. high and were split to simplify ingot extraction. Thus the molds could be re-used and the action of molten titanium cast against graphite could be studied.

Fig. 10—Macrosection shows dendritic, large columnar grain structure of a titanium cold mold ingot

The split cylindrical ingot mold shown in Fig. 4 was machined from National Carbon Co. Grade AUC graphite and fitted with a graphite plug bottom and a split graphite pouring funnel fitted to the top. A rectangular billet mold for 4 x 7-in. ingots 14 in. high with 1-in. radius corners also was machined from Grade AUC graphite. This mold also was top poured. Typical cast cylindrical and rectangular ingots are illustrated in Fig. 5 and 6, respectively. Lineal shrinkage of the ingots was observed to be about 2.5 per cent for 3-in. diam and about 3 per cent for 6-in. diam.

The exceptional fluidity of superheated molten titanium is illustrated in Fig. 7, which shows a fluidity spiral incorporated at the base of a cylindrical ingot. The ⅜-in. cross section spiral groove machined in the base plug was fed through a 1-in.-diam central hole. The molten metal, finished at 8500 amp, traveled about 30 in. of the total available 36-in. length of spiral.

A longitudinal section cut from a rectangular cast ingot and shown in Fig. 8 illustrates the typical cast macrostructure. The ingot was examined by an ultrasonic test method prior to cutting it to locate shrinkage defects and to determine their shape and size. The gross shrinkage seen in Fig. 8 was overcome by increasing the dimension of the feed riser from about 2.5 to about 4 in. in diam and employing directional solidification.

Improvement in reducing this gross shrinkage is shown in the longitudinal section cut from a rectangular ingot, Fig. 9. It will be noted that large equiaxed polyhedral grains are distributed uniformly across the ingot with a thin zone of fine grains at the chill-cast edges of the ingot. For comparison, the dendritic large columnar grain structure of a cold-mold ingot which had been melted followed by solidification in place is shown in Fig. 10.

An attempt was made to reduce the large grain structure of cast ingots through use of high-amplitude vibrations at a frequency of 120 cycles, but it did not result in significant reduction in grain size.

(To be concluded next month)

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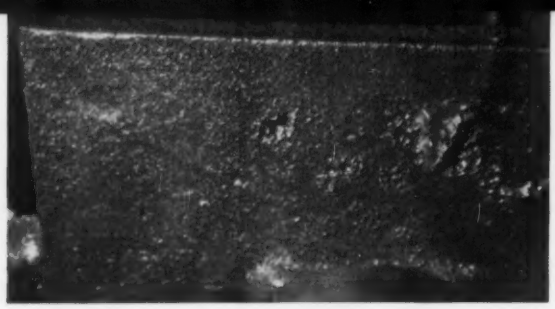

Fig. 1—Typical scum defect indentation on a steel casting looks like a shallow depression

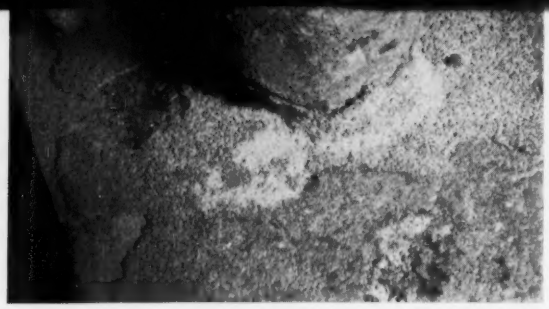

Fig. 2—A scum defect area on a casting has this appearance before it is shot blasted

Causes and Mechanics of

THE SCUM DEFECT

Deoxidizers are the source of the material which forms the scum defect. This article describes factors which influence formation of the defective areas and suggests some means of combatting them

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● SHALLOW DEPRESSIONS on steel castings Fig. 1, almost invariably found on the cope side, in the foundrymen's terminology are referred to rather distastefully as snotters or scum defects. They also are called dirt, slag, macroinclusions, and more recently, ceroxides. Regardless of the terminology, they are the subject of this paper.

The defect is found more frequently in small, thin-sectioned castings made in green sand than in large, bulky castings made in dried sand. Although the scum defect is not particularly important as far as strength and serviceability are concerned, it is unsightly and occasionally causes machining difficulties.

With the development of high-strength steels and reduced machining stock, "sand inclusions," as the machine shops call them, and the white powder that evolves from the castings during machining cannot be tolerated. When they occur, tools of high-speed machines are broken, and costly machining time is lost.

Such castings necessarily are rejected and returned to the foundry. The rejection is accepted, and the defect is labeled dirt. Because the scum is responsible for some of these so-called dirty castings, this investigation to determine its causes and mechanics was started.

Identification of the Defect—Fig. 2 shows a defective area on a casting at the shakeout, before shotblasting. It illustrates the difference between normal sand peel and that of a scum defect. The normal area is dark brown or gun metal in color, whereas the scum area is white, ranging to yellowish or light green. After shotblasting, the light area shows a shallow cavity with an irregular bottom.

Under microscopic examination at 40 to 60 diameters, the regular sand peel (Fig. 3) shows sand grains enveloped by a dark brown material which did not fill the molding sand voids completely. The scum peel (Fig. 4), on the other hand, shows a glasslike mass that completely enveloped the sand grains, filled the voids of the molding sand, and extended into the mold cavity to form the scum indentation on the casting.

Small fragments petrographically analyzed under polarized light show the normal peel to consist of iron oxides ranging from FeO and Fe_2O_3 to Fe_3O_4. Fayalite also may be present. Its formation depends on the rate of freezing and the oxygen content of the atmosphere in which solidification takes place.

The scum peel shows a glass with a varying degree of devitrified mass. It has a distinct crystallinity with a needle structure and includes immiscible liquids. The structure and the optical properties suggest mullite, kyanite, or sillimanite in a cristobalitic glass with MnO, FeO, and crystals of corundum (Fig. 5, 6, and 7).

From the ternary diagram of MnO-SiO_2-Al_2O_3 (Fig. 8) and the

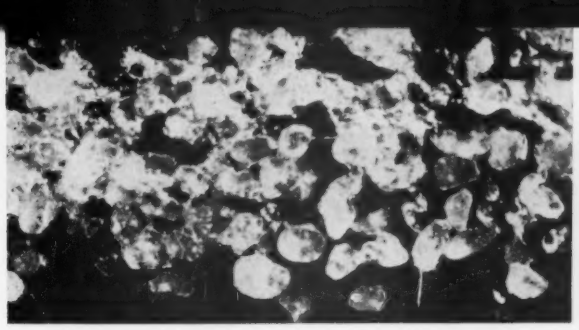


Fig. 3—Normal peel of sand at 25 magnifications with oblique illumination

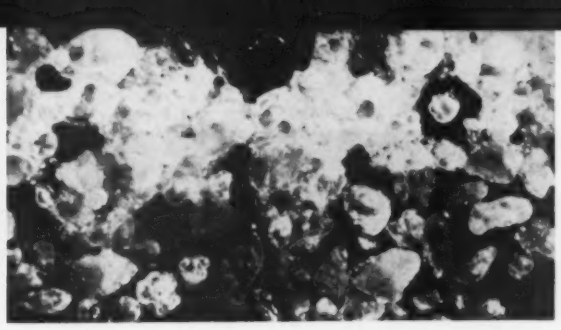


Fig. 4—Scum defect peel of sand at 25 magnifications with oblique illumination

phases revealed with the petrographic microscope, we can determine roughly that the chemical composition of the eutectic of this ternary phase will be SiO_2, 40-75 per cent; MnO, 15-40 per cent; and Al_2O_3, 5-25 per cent. For simplification, iron oxide was not taken into consideration since it affects this ternary system qualitatively in the same manner as MnO.

Chemical Analysis—The average chemical analyses of a good sand peel from basic and acid practice and of a scum defect peel from both practices are listed in Table I.

These analyses include, of course, the molding sand into which the glasslike material penetrated and filled the voids. Knowing that molding sands are compacted to about 55 per cent solids[1] and having the chemical composition of the sand and scum peels, we can calculate the chemistry of the scum material that filled the 45 per cent voids, as shown in Table II.

Tracing the Scum Defect—When castings are poured, a scum usually floats on the metal as it fills the riser cavity. This scum was collected on steel rods and analyzed. Microscopically, under polarized light, it showed intact sand grains and a glass similar to the one found on the casting defect. Because the samples were chilled when collected, very little devitrification was noted (from here on no microscopic analysis will be mentioned since the chemical analysis reveals more information.) The average chemical analyses and melting points of these samples are listed in Table III, samples 1 and 2.

Scum or very fluid slag also is noted on the spouts of teapot bull ladles, even when a highly refractory material such as zircon or alumina is used. The chemical composition of this scum is shown on Table III, sample 5. When cooled, these spouts show a shiny glassy material which adheres to the spout lining and is laminar in structure.

TABLE II—Calculated Chemical Analysis of Scum Material from Table I

	Acid	Basic
SiO_2	58.5	56.6
MnO	16.3	14.0
FeO	8.5	7.9
Al_2O_3	16.5	15.2
CaO	...	3.5
MgO	...	2.6

On the surface of metal poured from a teapot bull ladle into small bottom-pours, teapot shanks, or lip shanks, there also is a floating scum which seems to be generated continuously even when the metal is skimmed thoroughly. The chemical analysis of these scums is shown in Table III, samples 3 and 4.

This slag adheres to the surface of the ladles and builds up on the sides. When the ladles cool, they show a glassy, shiny surface, greenish brown in color. The chemical analysis of this material is shown in Table III, samples 6 and 7 (care was taken during sampling not to include any lining material).

Discussion and Theory—It was shown in the previous paragraphs that the composition of the defect is a slag or scum high in MnO-SiO_2-AlO_3. The high MnO content is significant, since this oxide could not arise from refractory material, molding sand, or ladle lining; these materials contain only traces of MnO. The MnO can form only as a deoxidation or reoxidation product. Al_2O_3, although present in refractories, is present in the defects in larger amounts than would be expected from contamination.

Stokes' law[2, 3] is followed so closely by slags and deoxidation products that they could not be emulsified with steel. Castings were poured from the same bull ladle at the beginning and end of a heat and showed no difference in the occurrence or severity of the defect.

In the event scum defects were due to slags or deoxidation products, some at least would have floated out of the metal with time, and the last castings would have shown the fewest defects.

Fig. 5—Small portion of scum defect material at 250X, polarized light

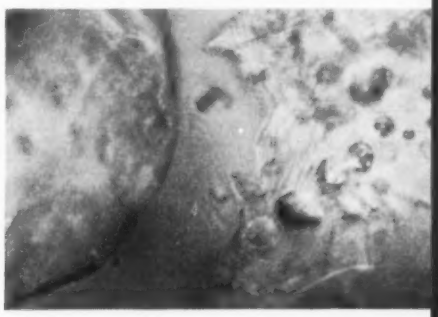
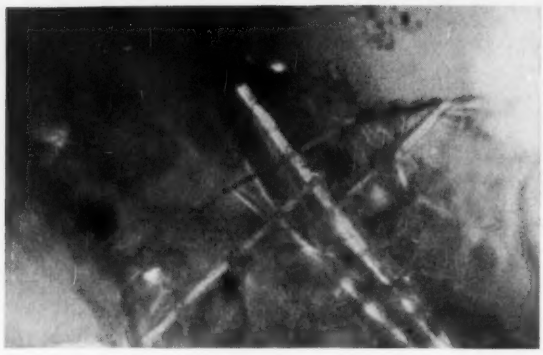


TABLE I—Average Comparative Chemical Analysis

	Furnace Practice	SiO_2	MnO	FeO	Al_2O_3	CaO	MgO	Loss on Ignition
Good Peel	acid	75.0	0.9	21.0	1.4	..	..	..
	basic	79.7	1.0	20.0	1.3	0.6	..	..
Snotter Peel	acid	72.5	9.0	4.7	9.5	..	..	..
	basic	74.4	8.0	5.5	9.0	2.0	1.5	..
Molding Sand		97.5	..	0.1	1.0	..	..	1.2

Individual analyses will vary from the above averages, sometimes quite widely, due to inability to reach equilibrium, and/or contamination by furnace and ladle slags.



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2. Scum floating on risers	acid	45.0	14.0	4.0	20.0	...	...	2190
3. Scum from small ladles b.p. teapot or lip	basic	44.0	30.0	7.0	10.0	.6	6.0	....
4. Same as No. 3	acid	45.0	30.0	7.0	13.0	.1	...	2280
5. Scum from spout of receiving ladle	acid	42.0	30.0	6.0	15.0	1.1	...	....
6. Glassy shiny material from ladle lining	basic	25.0	27.0	6.0	10.0	1.6	25.0	....
7. Same as No. 6	acid	66.0	9.0	7.0	14.0	...	...	2000
8. Furnace slags	basic	20.0	6.0	12.0	...	55.0	6.0	....
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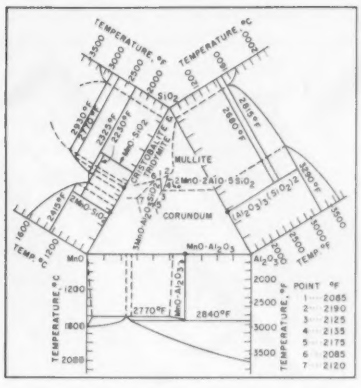

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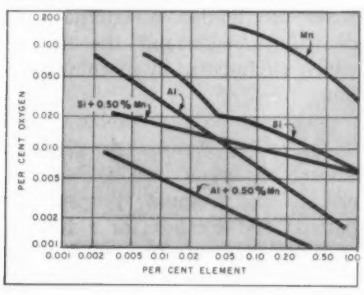

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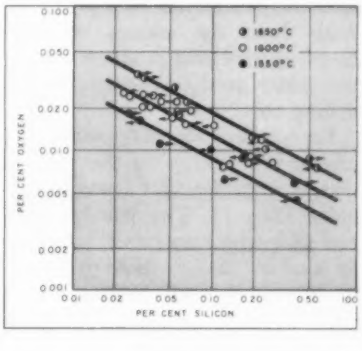

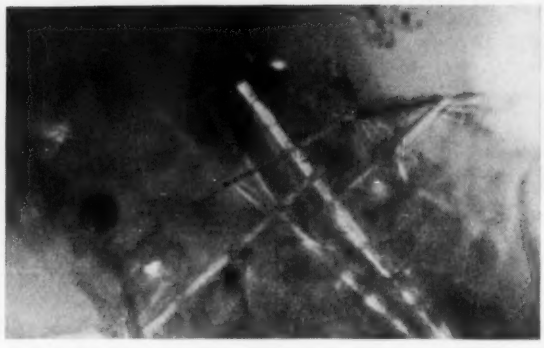

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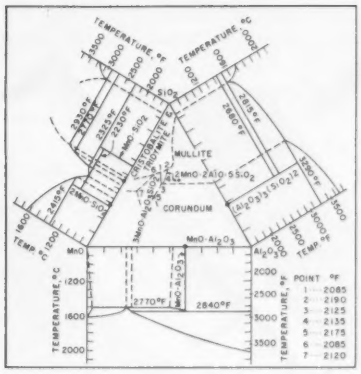

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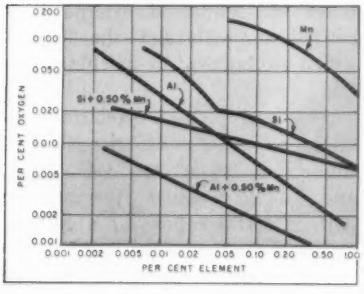

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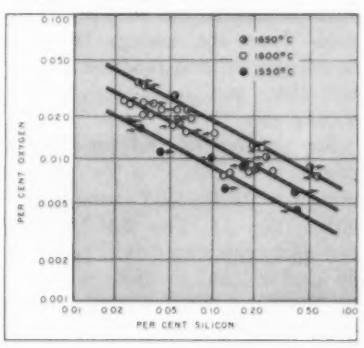

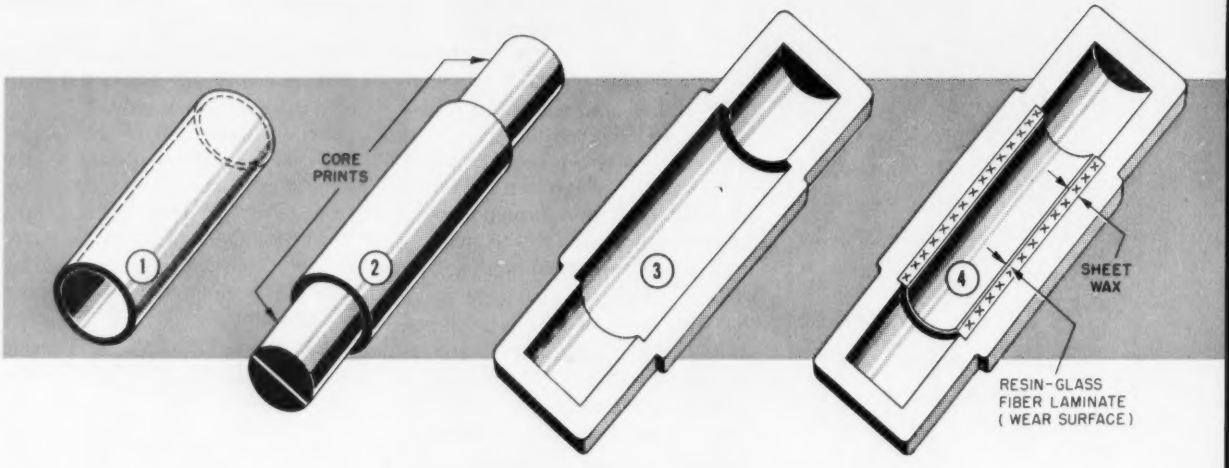

Fig. 1-4 (left to right)—1. Finished cylinder casting. 2. Pattern of cylinder with core prints. 3. Epoxy resin-glass fiber laminate shell made from drag half of pattern. 4. Shell laminate with buildup of wax sheet and wearing surface

Making Epoxy Coreboxes from Patterns

Coreboxes now can be produced quickly with epoxy resin-glass fiber laminates and the use of transfer techniques employed in statuary casting. This method saves manhours and produces precise coreboxes

By JOHN MacCLARENCE
Chief, Developmental Fabrication Branch
U. S. Army Engineer Research and Development Laboratories
Fort Belvoir, Va.

● ONE OF THE worst delays between finished design and finished casting often is the patternmaking time consumed in producing coreboxes.

With epoxy resin-glass fiber laminates and transfer techniques familiar to the statuary casting trade, coreboxes can be obtained quickly after the pattern has been produced. Aside from the savings in manhours, this method produces a corebox which conforms exactly to the mating part.

For purposes of illustration, this process is described in the production of a corebox for a simple cylinder (Fig. 1). The pattern, cope and drag with core prints, produced by conventional methods is shown in Fig. 2. A shell built up of a glass fiber and epoxy resin laminate is cast over the drag pattern. The latter first must be covered with a parting agent such as wax or a silicone.

After solidification, the shell is removed from the pattern (Fig. 3). The inner surface of this shell, other than the core print area, then is laid up with sheet wax. The thickness of wax is governed by the desired metal thickness, plus shrinkage and necessary allowance for a facing or wearing surface (Fig. 4). This surface may consist of a coating of shellac or a thin layer of epoxy resin-glass fiber laminate depending on the anticipated production requirements.

Such a corebox is perfectly satisfactory for a short run of hand-rammed cores, but greater production when cores are machine rammed requires the transfer of a solid, epoxy resin-glass fiber laminate from the original corebox. This step is accomplished first by making a reproduction or mating of the inner surface of the temporary corebox in plaster or in glass fiber-resin laminate. The required number of duplicates, which are the final coreboxes, then can be taken off the male cast. The finished boxes are reinforced externally as desired to withstand the stresses which are imposed by machine ramming.

Two examples of coreboxes produced by the methods described in this article are shown in Fig. 5, 6, and 7. Fig. 5 and 6 illustrate the pattern and corebox for a hollow, steel, offset cone. The corebox for this cone was made by building up

the equivalent metal thickness with strips of styrafoam. The outer surface, or sand line, consisted of one layer of glass fiber cloth impregnated with epoxy resin. This buildup gave a corebox thickness of approximately $\frac{5}{8}$ in., which was sufficiently rigid to provide a satisfactory core. To eliminate the need to join the cores after baking, the corebox for this pattern was constructed in one piece.

Fig. 7 illustrates a conventional split pattern, for a steel elbow transition, with plastic coreboxes made by the transfer method. The equivalent metal wall thickness was obtained by using sheet wax which was covered with a thin layer of glass fiber laminate.

Although no comparable attempt was made to produce a conventional wooden corebox for either the steel elbow transition or the steel cone, a considerable manhour savings resulted from use of these transfer techniques. As the patterns become more complex, these manhour savings should show an even greater increase.

In addition to the time savings gained in this process, the certainty of registration between pattern and cores is another plus factor. Because all transfers are made from the pattern, there hardly is any possibility of misalignment. The only possible error would be in the laying up of the equivalent metal thickness, and such an error can be corrected readily. Another advantage of this process is that coreboxes made with epoxy resin-glass fiber laminates can be stored without concern about moisture deterioration.

Epoxy resin was used as a binder for these glass fiber laminates because of its dimensional stability. The factor of expansion or contraction is practically zero.

Sheet wax was used for the buildup because of its "as-rolled" accuracy, which is within a tolerance of ± 0.005 in. On the two jobs described, close wall tolerances were not required. Where maximum accuracy is required, however, the combination of epoxy resin-glass fiber laminates and close-tolerance sheet wax delivers a casting considerably more accurate than can be obtained by conventional wood pattern practices.

We have found from our own experience that patternmaking personnel easily can acquire the knowledge and techniques required for this transfer process. In our own shop, we had the advantage of several years of experience in reinforced plastics fabrication. Even with no background in the use of plastics, however, proficiency can be attained quickly with the help of glass fiber or resin suppliers.

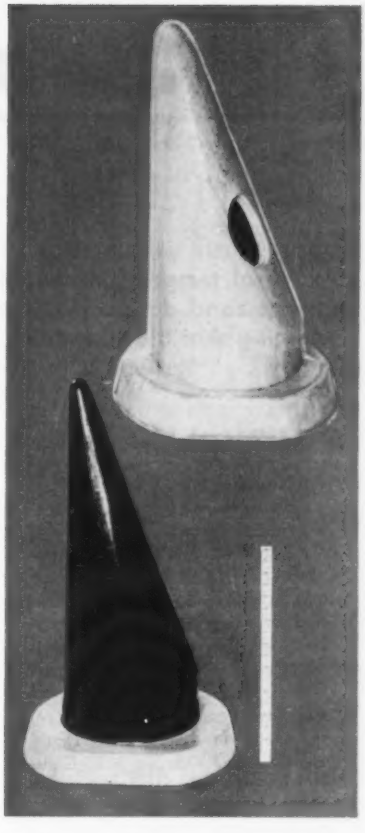

Fig. 5—Wood pattern and laminated plastic corebox for a hollow steel offset cone. Section from corebox shows laminate, which consists of styrafoam, glass fiber, and epoxy

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Fig. 6—View of steel cone pattern and interior of laminated corebox

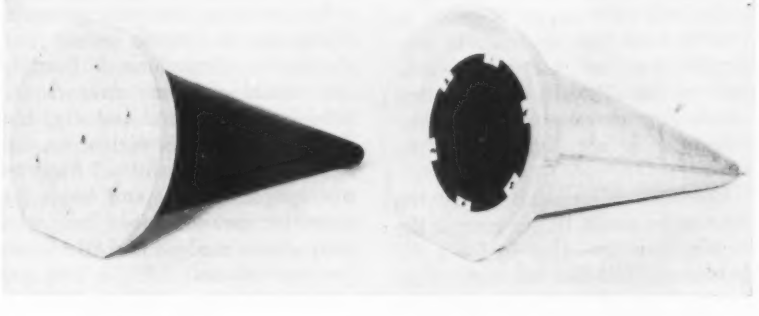
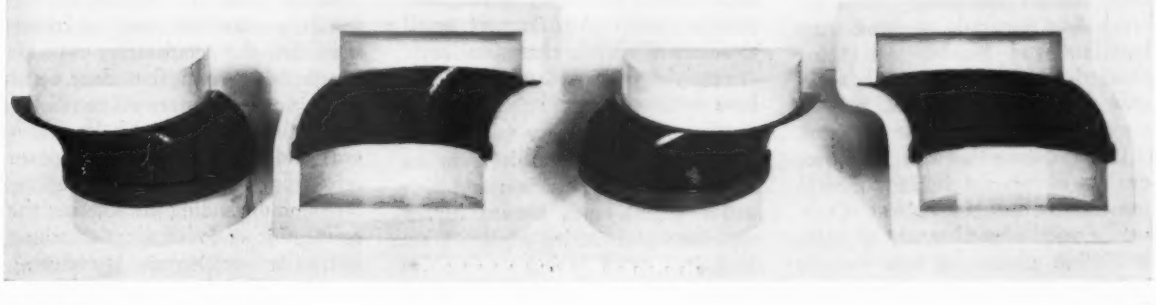


Fig. 7—Wood pattern and laminated plastic corebox are for steel elbow transition. The black portion of the corebox is the buildup of wax with wearing surface of glass fiber and the epoxy resin laminate



Questions and Answers

Low metal temperature causes scrap . . . Reaction information provides sand data . . . How to dimension square risers . . . Obtaining shot blasting data . . . Luster can be restored to brass plaques . . . Systematic pattern storage

Metal Temperature Too Low

Although I have been an industrial engineer engaged in engineering, manufacturing, and sales of metal and other products for many years, I expect shortly to go overseas as a member of an organization on special assignment. I have been told that one of my problems will be in a foundry where gray iron castings such as cylinder blocks and heads, crankcases, etc., are being made on a low-volume basis, and the scrap situation is high due to porosity, chills, etc.

The trouble is believed to be due to poor-quality coke which does not permit obtaining metal temperatures over 1350° C (2462° F). Some castings are reported to be poured as low as 1250° C (2282° F). What I would like to know is whether a booster can be attached to the cupola to increase the heat. Can the formula be changed to be able to use the present setup?

So little information is given in your inquiry that no concrete suggestions can be made. Possibly part of the difficulty in obtaining satisfactory temperatures is that the coke size is not suitable for the cupola.

Common relationship is for the coke to be about 10 per cent of the cupola diameter—that is, for a 36-in.-diam cupola the coke size should average around 3½ in. or be 3 x 4 in. screen size. It may be that the coke size is satisfactory but too much fine material, resulting from handling and breakage, is being charged. Using a fork with alternate tines broken out will help to remove much of the fine material.

Perhaps since the coke is of poor quality, not enough is being used to provide the necessary heat. Ordinarily with a good grade of coke, a 2000-lb charge of iron can be melted with 275 lb of coke to a temperature of around 2800° F. With poor quality coke, sometimes as much as 400 lb of coke is required without necessarily obtaining such temperatures. Hence, you may have to try variations in the amount of coke.

Possibly the amount of air being blown into the cupola is not correct for the amount of coke being burned. To burn completely 1 lb of pure carbon requires 152 cu ft of air at 60° F and 14.7 psi atmospheric pressure. If the coke contains only 85 per cent carbon, the amount of air will be about 129 cu ft, etc. Conversely, too high a volume of air also is detrimental.

As you indicate, higher temperatures can be obtained in the cupola by use of hot blast, but whether its use is economically justified will depend on the production volume.

We presume that your reference to change in formula refers to a change in composition. Possibly that would overcome some of the trouble of chills and porosity, but due to lack of information, we can deal only in generalities. Automotive cylinder blocks and heads for passenger cars are made from iron with a base analysis of 1.90 to 2.20 per cent silicon, 3.20 to 3.40 per cent total carbon, 0.60 to 0.90 per cent manganese, 0.15 per cent max sulfur and 0.15 per cent phosphorus max. Additions of small amounts of nickel, chromium and/or molybdenum are made to the base mix.

We suspect that your coke is high in ash and sulfur, resulting in an iron with low total carbon and high sulfur which tends toward higher shrinkage and chilled edges. With such iron, good gating systems are required to obtain solid castings. Difficulty with chilled edges may be counteracted in a large degree by addition to the ladle of graphitizing inoculating agents such as powdered graphite, crushed ferrosilicon, and other proprietary materials. Moculation also will result in considerable improvement in the microstructure of the castings.

Gives Reaction Information

Recently we came across a reference to differential thermal analysis in connection with sand, and will appreciate information on how that is accomplished.

Differential thermal analysis refers to differences in temperatures of what might be termed a standard and the unknown material undergoing observation. Briefly, small samples of 0.5 gram of the standard and the sand are placed in suitable holes drilled in a block of nickel, ceramic material, or platinum crucible. The standard is an inert material that experiences no thermal reaction when heated to the temperatures involved, and in this case is calcined alpha aluminum oxide.

Thermocouples connected in series are placed in the centers of the standard and unknown specimens, with the leads connected to a temperature recorder, meter, or galvanometer. The block with specimens and thermocouples is placed in a furnace in which the temperature can be controlled and increased uniformly.

When there is no reaction or transformation in the unknown specimen, the temperature remains constant. When that does occur there is a temperature difference between the unknown and the standard, and that moves up or down relative to the constant temperature line depending on whether the reaction is endothermic (absorbing heat) or exothermic (producing

heat). The temperature differences are charted to form a curve. From available information on reactions occurring at various temperatures, differentials in known materials, it is possible to determine what took place in the unknown specimen.

Principles of Slush Molding

We would like some information on slush molding. We recall that some of the details were presented in FOUNDRY, but do not remember the issue in which it was published. Can you help us out?

Some of the practices in slush molding have been discussed in FOUNDRY at various times; perhaps the article you have in mind is that entitled "Trouble Shooting —Slush Castings" by C. W. Ammen which appeared in the February, 1957, issue.

Generally the slush molding process is employed with zinc-base alloys, although lead-base and tin-base alloys sometimes are used. We also understand that some aluminum-base alloy castings are produced by that method.

With zinc, lead, and tin-base alloys, the molds usually are made of bronze cast in plaster molds. Cast iron molds are used for aluminum. In most cases the molds are two-piece type, although multi-part molds can be used.

The molds are equipped with handles and mounted on trunnions so that they may be rotated in a vertical arc. The filling or gate end of the mold is arranged in a gentle arc or slope. In pouring, that end is turned so that it is at the lowest point of the setup. As the operator pours metal with one hand into the gate from a small dip ladle, he gradually turns the mold upward with the other hand to permit the metal to enter the cavity slowly and gently.

Metal is allowed to remain in the mold until the casting walls reach the desired thickness. Then the gate end is turned down quickly to permit the remaining liquid metal to flow or slush out into the ladle. Metal is returned to the furnace.

Wall thickness of castings is controlled by mold and metal temperatures, rate of filling, and holding time before emptying or slushing. Molds usually are heated prior to the production run by pouring a number of dummy castings until they are free from cold shuts. After that the mold temperature is controlled by the rate at which the molds are filled or by immersing them in a tank of cold water from time to time.

Two zinc-base alloys used for slush molding include the 5.5 per cent aluminum, remainder zinc, and the 4.75 per cent aluminum, 0.25 per cent copper, remainder zinc types. Both grades have limitations of 0.007 per cent lead, 0.005 per cent each of cadmium and tin, and 0.10 per cent iron. For good castings it is essential that the impurity levels be maintained. The 5.5 per cent aluminum alloy is said to provide thinner wall castings.

A lead-base alloy for slush casting contains 13 per cent antimony, 1 per cent tin, 0.05 per cent arsenic, 0.1 per cent copper, and remainder lead. Tin-base alloy contains 4 to 7 per cent antimony, 1 to 2 per cent copper, and remainder tin. An aluminum alloy is the 5 per cent silicon type.

Removing Weathering Effects

One of our foundry friends suggested our asking you for a method of bringing back the original luster brass plaques which have been exposed to considerable weathering.

Procedures for bright dipping or cleaning of castings in foundries and plating shops are considerably different from those that could be employed for your purpose, particularly since a health hazard is involved in use of strong corrosive acids. In checking over some formulas for metal polishes, however, we found one which should serve satisfactorily with the application of a little elbow grease.

The materials can be obtained in your local hardware or paint store. The polish consists of 4 oz of powdered pumice, 4 oz of oxalic acid, and 1 qt water with the addition of a small quantity of any of the numerous liquid detergents on the market to act as a wetting agent. Use only a few drops. Oxalic acid —commonly used as a wood bleach, ink and rust remover, etc.—is a poisonous substance and proper precautions should be taken.

After the plaques are cleaned they should be rinsed well with water and dried. Coating with wax and polishing will give temporary protection, but longer protection will be obtained by spraying with clear lacquer.

Dimensioning Square Risers

We would like to know if any article has been published in FOUNDRY on the calculation of the dimensions of square risers.

We do not recall any article relating to determining dimensions of square risers since the general preference is for cylindrical risers.

As you undoubtedly know, the freezing or solidification rate of a round or cylindrical riser is much lower than that of other shapes, with the exception of the sphere, due to the volume-surface area relationship. Because of molding difficulties, the sphere seldom is employed as a riser, although some approach to it is used in cylindrical blind risers with hemispherical tops.

In designing a square or rectangular riser, consideration should be given to the fact that solidification rates at corners of castings are considerably higher than at plane or curved walls. It appears to us that this can be taken care of satisfactorily after the dimensions of a round riser have been determined, by making the dimensions of the square riser such that the volume-surface area relationship is the same as that for the round riser.

Since the riser heights will be the same in both cases, the volume-surface area relationships will be the same when the side of the square riser is equal to the diameter of the round riser.

Method for Conducting Test

Could you give me any information on how to conduct a sound shotblasting test using various types and sizes of shot? I will appreciate any suggestions.

Your inquiry on a shotblasting test does not indicate whether you just are interested in comparing the "life" of the abrasive, or in running a test which considers that and other factors such as surface cleanliness and finish of the work, etc.

If it is only the former you may be interested to know that there is a machine on the market which the manufacturer claims "is designed to produce an effect which compares with that experienced in actual blasting operations." The machine handles a 500 gram sample and results are obtained in about 30 minutes.

For a more elaborate test we include the following from an article, "Conducting Accurate Test for Abrasive Performance" which appeared in the March, 1943 issue of FOUNDRY:

"Accurate abrasive performance test can be conducted under actual operating conditions by firms interested in discovering whether their blast cleaning equipment is operating efficiently and economically with the abrasive used. Besides determining the correct size and type abrasive to use for particular cleaning applications, the test also may be made for comparing the merits of competitive brands of abrasive within the same size range.

"The following test can be applied to any airless blast cleaning equipment, such as Wheelabrator machines. However, allowances should be made for additional blasting wheels if a special cabinet or multi-wheeled machine is used for the test:

"1. The machine to be used should be cleaned thoroughly to remove all abrasive.

"2. Put a weighed amount of the required abrasive into the machine.

"3. The abrasive blast wheel should be new, all parts accurately weighed and marked for identification.

"4. End guards, both right and left, horizontal guard and curved liner over the wheel should be weighed.

"5. Record in a daily log the following information for the specified test period.

A. Type of work cleaned.
   a. Material
   b. Weight
   c. Shape

B. Number of loads and cleaning time and weight.

C. Actual hours of wheel time with abrasive flowing.

D. Loading and unloading time should be segregated as no abrasive wear occurs during this time.

E. Record the amount and time when new abrasive is added.

"6. Take a sample of the abrasive from the feed spout every 4 hours and keep these samples in bags properly labelled as to the time the sample was taken. These are to be used later to show abrasive breakdown.

"7. At the end of the run clean the machine.

A. Weigh abrasive remaining.

B. Weigh blades, guards, and liners.

"8. Repeat above steps for each abrasive tested.

"9. The ventilation must be the same during all tests.

"To determine the relative efficiencies of the abrasives tested, the following elements should be checked.

1. Abrasive breakdown.

Analyze by screening if possible, the samples taken at the 4-hour intervals. Note the condition of the abrasive as to the quantity of usable material remaining in each sample.

2. Cleaning efficiency.

Time required to clean identical loads of work. There must be a fair appraisal of the degree of cleaning of the parts. That is, all work must be cleaned to the same extent, otherwise there will be no just basis of comparison.

If one abrasive will clean faster than another, it must be assumed, all other factors being equal, that it is a more efficient abrasive.

However, cleaning efficiency must be matched with abrasive breakdown to obtain the true merit of the product.

If breakdown is excessive, even though cleaning qualities are excellent, it is not only false economy to continue to use the faster cleaning abrasive, but it also results in a waste of costly abrasive. The most economical abrasive to use in any blast cleaning machine is that which combines long life with high cleaning efficiency."

While this description of a suggested procedure to be followed in conducting a test on abrasive performance is rather lengthy, it appears to cover all of the factors involved. The information obtained on time required brings identical loads to the same degree of cleanliness.

Keeping Track of Patterns

In our foundry in Mexico which produces brass valves, we have considerable difficulty in locating the various pattern plates when we want them. Can you suggest any method whereby we can find them at any given time?

It appears that you do not have any pattern storage department, or if you have, there is no system of arrangement for the patterns. So far as we can see, it practically is impossible to keep track of the patterns without some systemization.

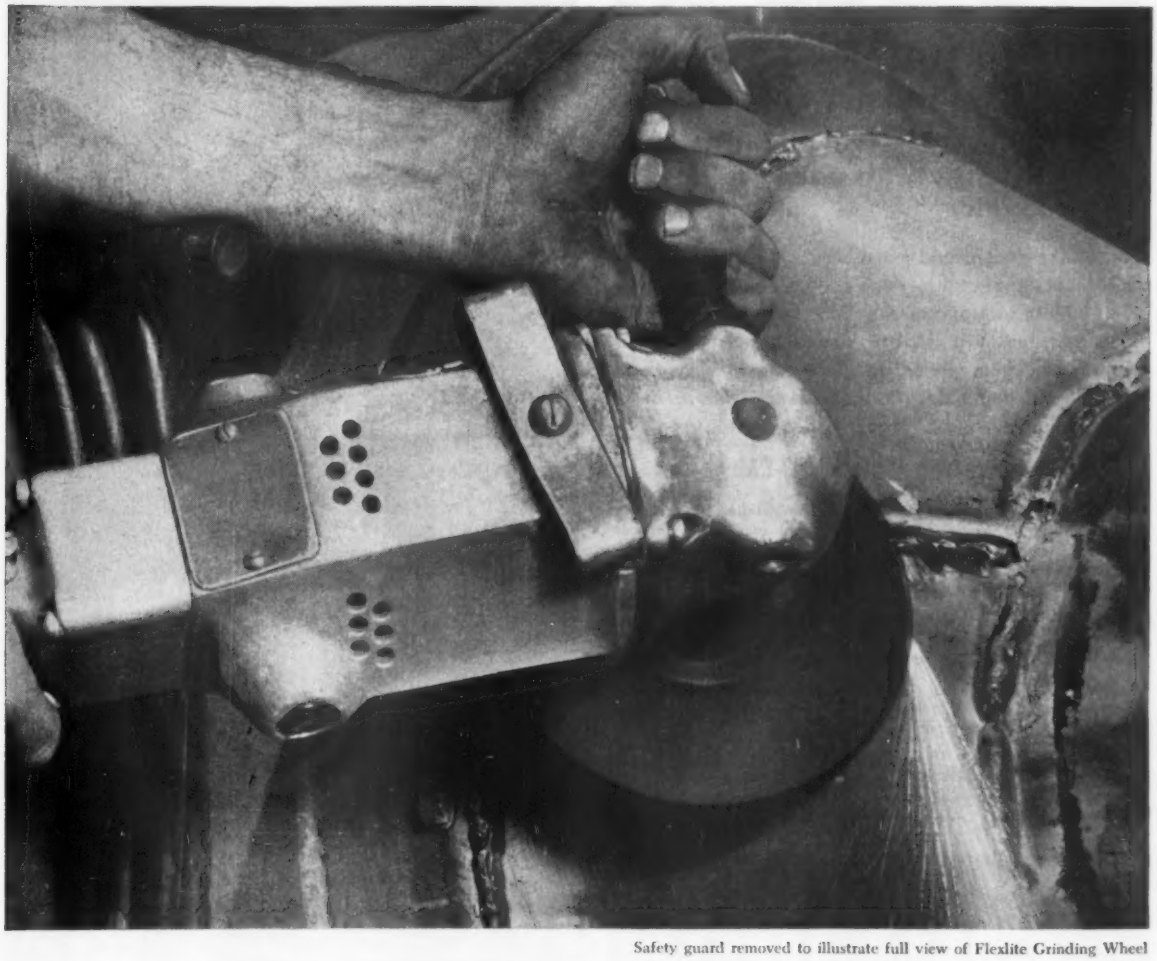
Our suggestion would be to construct a series of shelves spaced at a height sufficient to accommodate the pattern plates when stood on edge. The shelves are divided into vertical compartments wide enough to hold a set of cope and drag plates or a single plate if a matchplate is used. If desired, the compartment may be wide enough to accommodate the corebox also so that all equipment is in one place.

Compartments, pattern plates, and coreboxes should be designated by some system of numbering, preferably as simple as possible so that they can be identified easily, and the numbers should be attached permanently. Those patterns used most often should be placed on the lower shelves.

Keeping track of the patterns should be delegated to one individual such as the foundry foreman, his assistant, or the foundry clerk. This can be accomplished by making out a card for each pattern or set of patterns which carries the proper designation or number. When the pattern is taken from storage, the date and the molder's name, number or floor is entered. When the pattern is brought back, the date of return is entered on the card and the pattern put in its proper place in storage as soon as possible. It is essential that this be done because if the returned patterns are allowed to lie around on the floor you still will have the problem of locating some of them.

The cards may be kept in one file in numerical sequence or in two files—one termed active for those patterns in use, the other inactive. Hence, at any time inspection of the cards will indicate where the patterns are.

FLEXLITE RAISED HUB GRINDING WHEELS



Safety guard removed to illustrate full view of Flexlite Grinding Wheel

PEAK EFFICIENCY...PEAK STAMINA for high-speed portable grinding

From start to finish, U. S. Flexlite is the wheel that's built to reduce overhead. For smoothing and finishing welds, this is the most efficient, durable wheel in portable grinding. Comes in two types:

A24-H-BWD designed for use where fast rate of removal is the prime objective.

A24-Q-BWD designed for top efficiency and long life. Recommended for heavy-type applications such as heavy-gauge metals and heavy welds.

U.S. Flexlite Raised Hub Wheels are built for the utmost safety—their manufacture is controlled by unerring electronics. Layers of fiber glass reinforce the wheel. These wheels give you a cost-saving advantage right from the start.

• • •

Ask your "U. S." Distributor, or call or write U. S. Rubber, 10 Eagle St., Providence, R. I., or your local "U. S." District Office, or the address below.

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Circle 609 on Page 53

LET'S LOOK at

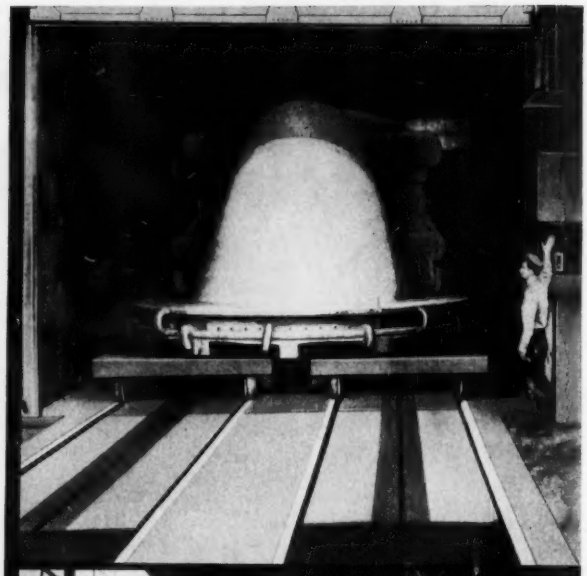
OVENS for every baking requirement

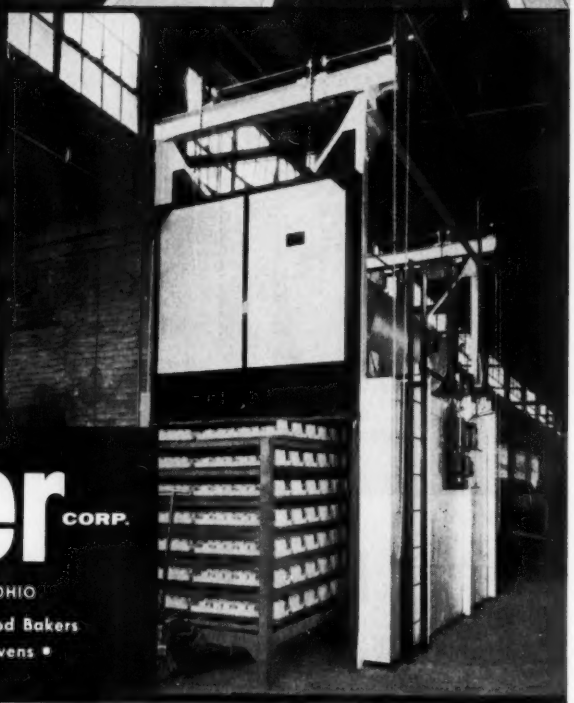
OVENS that will be faster and less expensive to operate

OVENS that are designed to best fit your operation

Carl Mayer designs and manufactures all types of ovens as well as "specials" to meet unusual operating conditions. Most incorporate the Carl Mayer recirculating heating system with sealed combustion chamber that keeps gases from prematurely escaping into the load area. Cores and molds are baked evenly with no burning. Temperatures are always under control.

Write for Bulletin 53-CM





TOP RIGHT—This large car type mold oven is installed at Pittsburgh Steel Foundry. Its special triple slotted panel construction reduces heat loss 1/3. Fuel savings up to 50% over old conventional methods are possible. Drying time is often cut in half and temperatures are uniformly controlled.

MIDDLE RIGHT—This rack type core baking oven is at the Fremont Foundry Co., Fremont, Ohio. It is equipped with a recirculating combination gas-oil fired heating system.

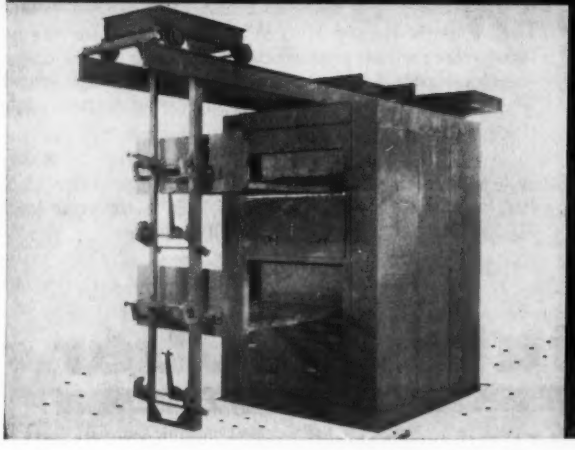
BOTTOM RIGHT—Vertical Core Oven (unloading position) at A. C. Williams Company, Ravenna, Ohio. This oven is 11'-0" wide x 11'-0" deep x 45'-0" high.

BELOW—Our standard rolling drawer type core baking oven. The heating equipment (not shown) may be mounted on floor beside unit or on the roof. Particularly adaptable to brass and aluminum foundries.

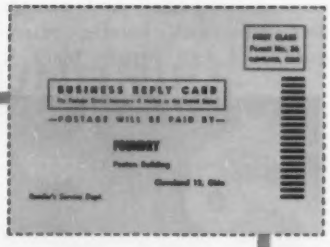
THE **carl mayer** CORP.

20800 CENTER RIDGE ROAD CLEVELAND 16, OHIO

OTHER PRODUCTS: Heat Treating Ovens and Furnaces • Rod Bakers • Welding Rod Ovens • Paint and Ceramic Drying Ovens • Special Processing Equipment and Accessories



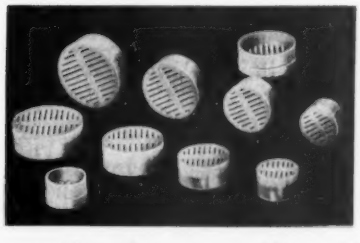
For More Information
Use Reply Card—Page 53



What's New in Equipment and Supplies

NYLON COREBOX VENTS

Nylon vents for blowplates and coreboxes are claimed to remain open and to operate efficiently under constant use. Because sand does



not stick to the vents, mudding and patching of cores is unnecessary. No special tools are needed for installation or removal, and individual vents can be contoured quickly. Contour is limited to depth of slot or 5/32 in.

Mounted on vertical sides of coreboxes, vents will not distort cores or restrict their removal. Vents are 0.0005 to 0.008 in. oversize to permit firm press fitting and are acid, oil, and steam resistant. Slot size is 0.014 in.—**Ronson Industries**, subsidiary of Monarch Products Corp., 110 E. 115th St., Chicago 28, Ill.

For More Details Circle No. 470—Page 53

DUCTILE IRON TREATMENT

High-magnesium, silicon-base alloy called EM alloy 55 is said to achieve efficient production of ductile iron. It contains 30 to 32 per cent magnesium, 50 to 55 per cent silicon, 4 to 5 per cent calcium, and 1 per cent mischmetal.

Treatment is accomplished by placing the alloy in a refractory basket and plunging it into a ladle of iron. This technique yields up to 50 per cent recovery of magnesium, excluding that used for desulfurization. Plunging eliminates most of the dross formed by oxidation of magnesium and promotes uniform recoveries. Temperature loss is minimized because the alloy's high magnesium content permits use of smaller amounts of material than required with more dilute alloys. The pyrotechnics which normally accompany magnesium treatments are reduced by the balanced composition of the alloy.

The 1 per cent mischmetal helps to counteract tramp elements which prevent formation of the spheroidal

graphite structure.—**Union Carbide Metals Co.**, division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 471—Page 53

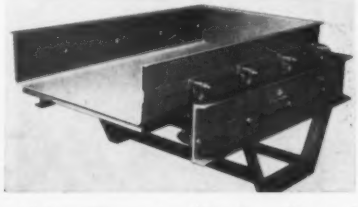
ARC TIME RECORDER

Meltime arc time recorder is claimed to be the most accurate recording tool available to industry for calculating incentive rates for welding, cutting, and gouging operations. It can be used to record arc time down to tenths of a second. To measure such work for incentive plans, it tells the precise time involved on any job, eliminating physical measuring.—**Arcair Co.**, Box 431, Lancaster, Ohio.

For More Details Circle No. 472—Page 53

VIBRATING FEEDERS

Vibrating feeders are made in basic standard sizes ranging from 3 to 10-ft lengths and 6 to 36-in.



widths. They simplify handling of short carries of bulk materials in limited space. Drive units are completely enclosed, and rubber-bushed, spring-loaded supporting arms eliminate lubrication problems. Lack of complicated electrical systems facilitates maintenance. Four standard choices of drive position are available. Unit shown is 5 ft 6 in. long with 36-in. pan. Capacity is 200 tons per hour.—**Lo-Veyor Div., Ajax Flexible Coupling Co.**, Westfield, N. Y.

For More Details Circle No. 473—Page 53

MAGNETIC INSPECTION

The Detectascope is a portable magnetic inspection system for detecting surface and subsurface defects in ferrous metal parts. It also demagnetizes parts after inspection. The apparatus consists of a remov-

able electromagnet and demagnetizer unit with handle, extension cord, and foot switch; black light

hood assembly; transformer; 5-gal tank; agitating pump; and voltage regulator. All are mounted on a mobile cabinet.

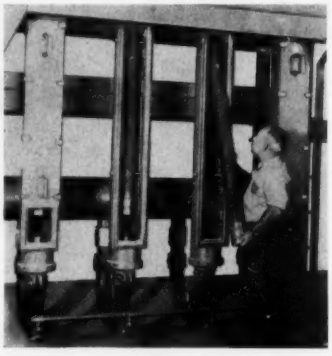
The electromagnet is placed on the part to be explored, the current is turned on with the foot switch, and the area to be inspected is painted or sprayed with an oxide solution from the tank. Iron particles in the solution concentrate at any defect. The part then can be demagnetized with the same unit.—**Ferro Machine & Tool Corp.**, 5514 W. Washington St., Indianapolis 41, Ind.

For More Details Circle No. 474—Page 53

PNEUMATIC SAND SCRUBBER

New Even-Flo pneumatic sand scrubber offers improvements over earlier models which are said to speed reclamation, provide more positive control over sand flow, and allow easier access for maintenance. Chief feature is elimination of the stepdown cell design. Arrangement of scrubbing cells in a line permits additional scrubbing cells to be added as required.

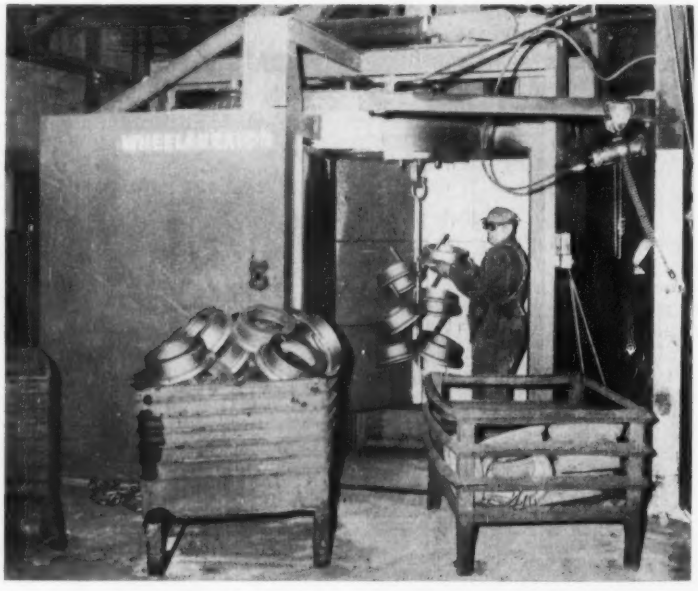
Other features include diversion plates which prevent sand segregation; elimination of sand feeder; design which permits outside adjustment of space between blast



tube and air nozzle and easy removal of blast tubes through side of housing; and separate valves which permit individual adjustment of air to each cell.—**National Engineering Co.**, 549 W. Washington St., Chicago 6, Ill.

For More Details Circle No. 475—Page 53

Airless Blast Cleaning Cabinet Is Versatile



Spinner Hangar airless blast cleaning cabinets are versatile and adaptable, the manufacturer states. They are designed to meet the cleaning needs of users whose production rates outstrip the capacity of standard blast equipment, yet are not large enough to warrant installation of high-production equipment such as monorail blast cabinets.

Each machine is designed for a specific cleaning application, but essential features are compartmented work areas, spinner devices for rotating work while it is blasted, airless blast units, and work-carrying fixtures. Indexing arrangements turn the compartments so that one is always exposed to the operator for loading and unloading. Blasting can be achieved in one or several stages and is continuous. The cabinet permits a plant to clean a large variety of parts on a single machine. — **Wheelabrator Corp.**, 1102 S. Byrkit St., Mishawaka, Ind.

For More Details Circle No. 499—Page 53

MULTIPURPOSE FILES

Line of multipurpose files is called the Criss-Cross Multi-Kut because of a design which combines teeth of varying length with criss-cross grooves. These files are said to rough to size and smooth to finish with fewer strokes, less pressure on tough metals, and less loading on softer metals. They are available in flat, half-round, and square shapes in 8, 10, 12, and 14-in. sizes. —**Heller Tool Co.**, Newcomerstown, Ohio.

For More Details Circle No. 476—Page 53

EJECTOR PINS

Letter-size diameter ejector pins are made in standard 10-in. lengths. They combine with regular fractional and 0.005-in. oversize pins to provide a full range of standard stock sizes for diecasters. All are heat treated die steel, ground, nitrided, and honed to a fine finish. Tough cores provide long mold life, and 70-80 R_c surface hardness reduces friction, keeping pins from wearing holes in cavities. Pin heads are solid forged and annealed for added strength and to prevent breakage under severe use. Diameters

International MINERALS & CHEMICALS

A REPORT TO FOUNDRIES

FROM TOM BARLOW

"Sound" reason for diaphragm molding

It has been stated frequently that "the foundry is a good place to work." We believe this. We also believe that the diaphragm method of molding helps to make it even more true. With this method, there's no jolting or pounding on the flasks, pattern or equipment. There is no noise fatigue on the operator, no need for heavy foundations to absorb the shock and vibration.

Granted, it may not be possible to translate quietness into profits. But remember — the same motions which create noise also cause maintenance of equipment, patterns, flask and rigging. These items are translatable into costs . . and their elimination, into profits.

Even beyond the reductions in noise and maintenance, the Taccone Diaphragm Molding Machine holds some pretty distinct advantages. Most people are even more impressed when the machine is equipped with auxiliary equipment to bring the flask to the machine and take the finished molds away.

However, foundrymen know that the most important feature over the long pull is not so much the ability to produce castings as the ability to sell them. That calls for quality. And there, in a word, you have the most important contribution of the Taccone Machine. An inherent part of the high-pressure molding concept is the capacity to make a mold of uniform density and hardness. This, in turn, results in a casting of better finish, size, control, dimensional stability and in satisfied customers.

"So quiet you can hear a pin drop"

Contrary to most fireclay binders which enjoy only a local market, Revivo Bond is used nationally. Since 1923, it has been the standard of comparison for refractory bond clays. And because it is the strongest of the fireclay binders, less need be used. Result: higher permeability and flowability.

The high fusion and sintering point of sands made from Revivo Bond explains why it's so popular for heavy iron and steel castings. With its high strength, it burns out more slowly than other clays — particularly the bentonites. So costs are reduced.

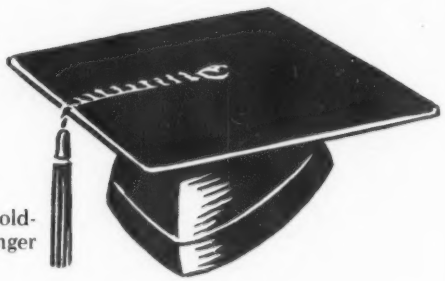
Because more Revivo must be used as compared with the stronger bentonites, more clay is present in the sand. This means the sand dries out more slowly in use. It is less brittle, and patching is easier. Total expansion is lower, which lessens the tendency of rat-tails, buckles and scabs.

What's more, experimental work indicates less yield in mold walls with Revivo bonded sands than with bentonite sands. That's a big factor in maintaining dimensional accuracy of castings . . . and an even bigger one in preventing shrinks.

OVER

Circle 611 on Page 53

easiest quiz you've ever tried . . .



These days it's rare to pick up a magazine without encountering a quiz that rates your ability to get along with your wife, get along without your wife or some such subject. For those of us who rebel at consistently being classed as "average," the following quiz is guaranteed to restore confidence. Carries some pretty significant facts about Plasti-Bond, too.

WHAT CHEMICAL BOND...

1. Gives high flowability in molding sand with green strengths from 12 to 20 pounds . . . toughness exceeding 200?
2. Lets you operate 120 fineness sands with as little as 2% moisture or less?
3. Permits deep lifts with sand of less than 2% moisture?
4. Offers high ramming and molding hardness without danger of scabs and blows?
5. Enables you to pour brass, bronze, aluminum, gray iron and malleable in the same sand? (And gives you smoother castings on all of them!)
6. Lets you convert from tough to silky sand from batch to batch without changing the type of additive or base sand?
7. Improves the ability to blow green sand molds without reducing moisture or strength?
8. Maintains higher moistures in the summer to prevent drying out of sand without loss of finish and flowability?
9. Gives clean peel and a fine finish without sea coal or other carbonaceous materials?
10. Should be added if your sand is too tough?

Answers:

1. Plasti-Bond. 2. Plasti-Bond.
3. Plasti-Bond. 4. Plasti-Bond.
5. Plasti-Bond. 6. Plasti-Bond.
7. Plasti-Bond. 8. Plasti-Bond.
9. Plasti-Bond. 10. Nope, it's Maplex. Oh well, nobody's perfect.

molding mathematics

It may be reasonably obvious that the name *Triplact* is short for triple-action. Less obvious, though, is the fact that there are three different Triplacts, which means that there are a total of nine actions.

There is a Triplact for cores which, peculiarly enough, is known as Core Triplact. There is a Triplact designed especially for facing sands which we call Regular Triplact. And there is one particularly suited for continuous systems. That's XX Triplact.

Each of these materials performs its triple action as follows:

1. Increases the flowability of sand to provide harder, denser molds or cores and improved finish. Sand is softer, silkier, more workable . . rams better on vertical surfaces and deep pockets. What's more, the sand blows or shoots better with standard equipment.
2. Provides a strong reducing atmosphere needed to stop burn-in and penetration. Castings clean faster and better.
3. Controls both expansion and collapsibility to eliminate buckles, scabs and veins. It's not a pitch, not a coal . . will not cause lumpy shakeout or pitch balls. It gives a smoother, softer shake-out whether it's used in molding sand, oil sand cores or CO process cores.

EC-2-128

Creators of Living Minerals

EASTERN CLAY PRODUCTS DEPT.

INTERNATIONAL MINERALS & CHEMICAL CORPORATION

Administrative Center, Old Orchard Road, Skokie, Illinois • ORchard 6-3000

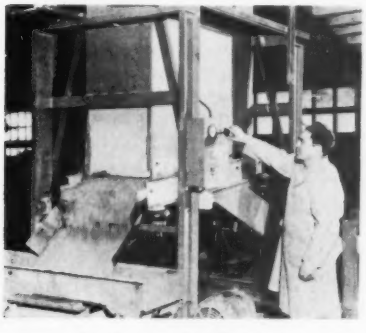
Circle 611 on Page 53

can be supplied in graduated steps from 0.0625 to 0.750 in. Stepped-diameter pins can be produced on special order.—**Detroit Mold Engineering,** 6686 E. McNichols, Detroit 12.

For More Details Circle No. 477—Page 53

VIBRATING FEEDER

Amplitrol mechanical vibrating feeder with pneumatic control system features fully variable, stepless amplitude control and Natural-Frequency drive. The drive unit is a 900-rpm, alternating-current motor-exciter which is mounted between two banks of heavy-duty air springs. Motor-exciter and springs are set in a housing which can be



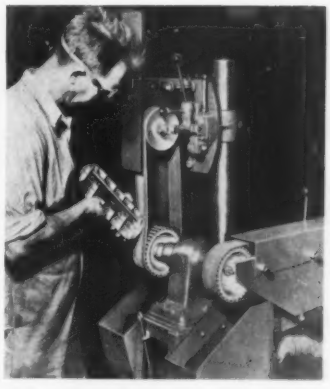
mounted above or below the trough.

Motor size is governed by the size of the trough. In standard models, only ½ hp is required to drive troughs up to 24 in. by 8 ft. Totally enclosed and nonventilated, the 220/440 motors are built with pregreased, sealed ball bearings. The springs provide about 90 per cent of the force required to drive the trough once the vibrating stroke has been selected pneumatically. Design of the feeder eliminates chains, gears, V-belts, rectifiers, rheostats, and variable speed drives. —**Carrier Conveyor Corp.,** 221-A N. Jackson St., Louisville, Ky.

For More Details Circle No. 478—Page 53

BELT GRINDERS

Versatility and low cost are features of a new line of 2½-in. belt grinders for fast, efficient grinding, buffing, and deburring. Accessories are available for special job setups in addition to the four standard ones. These accessories include vertical support unit, safety guards, dust and chip chute, fully adjustable platen, dust collector, and adjustable tool rest for grinding. A 4-in. backstand idler unit also is



available. With this unit, a polishing lathe using setup wheels or a bench grinder using grinding wheels can be converted to the coated abrasive belt method of grinding and polishing. — **Rockwell Mfg. Co., Walker-Turner Div.,** Dept. 1007, 400 N. Lexington Ave., Pittsburgh 8, Pa.

For More Details Circle No. 479—Page 53

CONTROL VALVES

Poppet pilot ½-in., B-type, single and double solenoid-operated control valves are said to combine rugged construction, compact design, and zero leakage. These valves have full ½-in. flow—275 cfm at 100 psig. Valve housings are aluminum castings. Flow is through the hollow, radially ported, stainless steel plunger and out the connected piping. Explosion-proof solenoid operators are available.—**Hunt Valve Co.,** Salem, Ohio.

For More Details Circle No. 480—Page 53

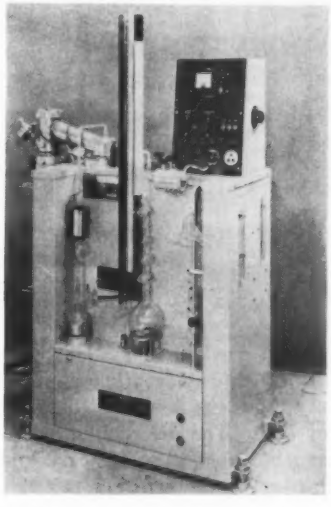
BLASTING NOZZLES

Uniflo nozzle for shot, grit, and sand blasting is said to retain its original orifice size, thereby keeping the blast concentrated. This concentration speeds cleaning and saves compressed air. The nozzle

liner is tungsten carbide, and the jacket is kirksite.

These nozzles are reported to be equally effective in hand, cabinet, and barrel blasting operations. Orifice sizes are 3/16, ¼, 5/16, ⅜, 7/16, and ½ in. A ¾-in. size also

Vacuum Fusion System Analyzes Gas in Metal



Vacuum fusion apparatus for macrodetermination of gases in steel and other metals is exceptionally compact and is housed in a metal cabinet.

The furnace consists of a stainless steel head with a clear silica furnace tube 2¼ in. in diam which is cooled by water circulated through a clear plastic case surrounding it. The silica tube houses a graphite crucible and graphite powder insulation with a mechanically operated graphite stopper working from an external electric drive. Samples of up to 10/15 grams of steel can be accommodated.

The pumping system quickly extracts a large mass of gas from the furnace and compresses it into a small collecting space. Collected gases can be expelled into a vessel for separate analysis or if an analysis section is fitted to the equipment can be circulated and dealt with in it.—**Edwards High Vacuum Ltd.,** Manor Royal, Crawley, Sussex, England.

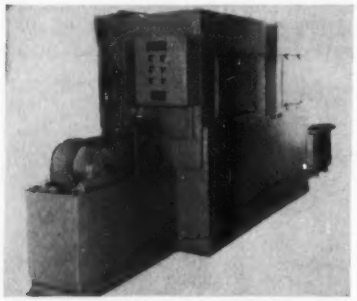
For More Details Circle No. 500—Page 53

is available. Life of the nozzle is claimed to be at least 200 times that of some other types.—**W. W. Sly Mfg. Co.**, Cleveland 1, Ohio.

For More Details Circle No. 481—Page 53

WET-BLAST MACHINE

Automatic wet-blast machine removes light flash and burrs from diecast parts. It is made with stainless steel and uses no pumps or moving parts in its blast circuit. In



addition, the unit incorporates a complete process cycle including automatic unloading and oxidation inhibition in its final stage.—**Hydra-Blast Mfg. Div., Automation Services Inc.**, 7650 Fenkell Ave., Detroit 38, Mich.

For More Details Circle No. 482—Page 53

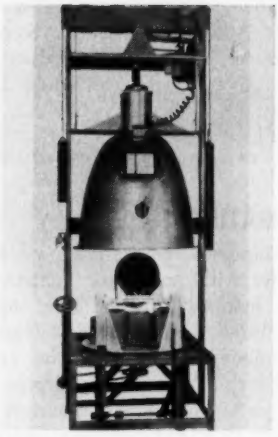
JIB CRANES

Model WBFC jib cranes are designed for maximum hoist travel when a minimum of overhead room is available. They are mounted on existing building columns or are furnished with supporting structures. These cranes are available with capacities to 3 tons and spans to 20 ft. They are designed for 180-degree rotation. The design to clear headroom obstructions is said to be achieved without detracting from efficiency of the cranes.—**All-State Engineering Co.**, 7092 N. 76th St., Milwaukee 8, Wis.

For More Details Circle No. 483—Page 53

HIGH-PRESSURE WATER GUN

Originally designed for the precision casting industry, this high-pressure water gun can be used to clean foreign matter from normally inaccessible parts of castings. It operates with ordinary tap water



and a compressed air line of 100 psi and maintains a constant operating pressure of 5000 psi. Chrome-clad pistons protect against corrosion. The unit is portable.—**Centrifugal Casting Supply Co.**, 147 W. 42nd St., New York 36, N. Y.

For More Details Circle No. 484—Page 53

PLASTIC PATTERN MATERIAL

Masterlite 320 is said to duplicate the good qualities of natural wood mahogany, yet not to swell or shrink with changes in moisture content. It averages about 30 lb per cubic foot and is shaped into panels 1 in. thick, 1 ft wide, and 5 ft long. A stable plastic material, it is easily machined and may be placed in boiling water with no harmful effects. Other characteristics include good impact qualities, high impact strength, and uniformity of physical properties. The material is carvable with sharp knife and can be assembled with nails, screws, or Epibond cementing agents.—**Furane Plastics Inc.**, 4516 Brazil St., Los Angeles 39, Calif.

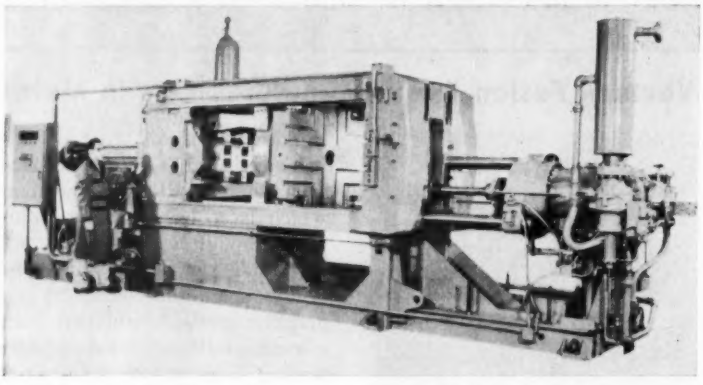
For More Details Circle No. 485—Page 53

HIGH-SILICON FERROCHROME

High-silicon refined chrome is said to provide the lowest cost chromium and silicon available for either cupola or ladle additions to cast iron. Savings reportedly are as much as $1.90 per ton for a 1 per cent addition in the cupola charge and $1.25 per ton for a 1 per cent chromium ladle addition.

The silicon introduced acts as an inoculant and provides protection against the tendency of chromium to form chilled corners and edges in castings, thus reducing the amount of additional inoculating alloys needed to prevent chill. By pro-

1000-Ton Machine Makes 40-lb Diecastings



New 1000-lb diecasting machine is designed to make 40-lb aluminum castings such as gas meter housings, motor blocks for outboard motors, and street lighting housings. It incorporates the company's prefill injection system, which provides high initial speed with high final impact, for production of dense diecastings with fine surface finish.

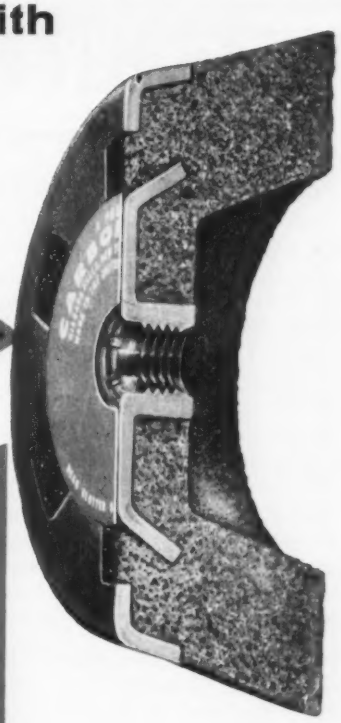
One-piece alloy steel frame is said to be equal to the full diameter of 9¼ tie bars and to insure permanent, parallel alignment of the platens. Die height is adjusted by a single hand crank.

The maximum die height is 42 in., adjustable to a minimum of 39 in., with a total daylight of 72 in. The die opening is adjustable from 30 to 10¼ in., and the movable platen, completely unobstructed, is 60 in. wide, with 60-in. vertical clearance between beams. — **Lester - Phoenix Inc.**, 2711 Church Ave., Dept. N-14, Cleveland 13, Ohio.

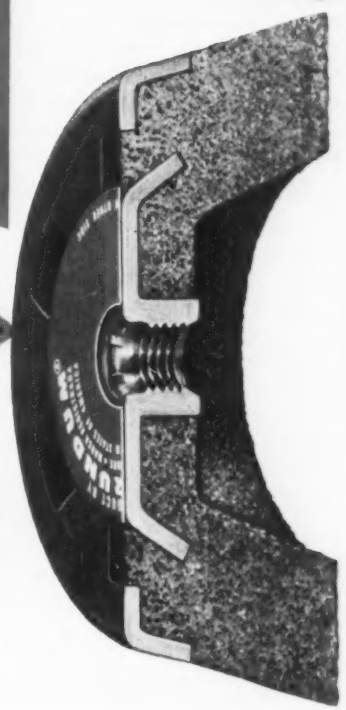
For More Details Circle No. 501—Page 53

new development for rough grinding applications... the cup wheel with

"built-in guard"



- extra strong
- break-resistant
- positive mounting
- no work interference



Here's a new, portable cup wheel by CARBORUNDUM that offers outstanding safety and performance features for all rough grinding applications in steel mills, foundries, welding shops, etc. The "built-in" guard consists of a one-piece combination steel back and prong-type bushing molded into the fast-cutting resinoid bond. It is easy to mount, eliminates heavy conventional safety guards, and does not interfere with the work piece.

CARBORUNDUM
REGISTERED TRADE MARK

Send for more information **TODAY →**

THE CARBORUNDUM COMPANY
Bonded Abrasives Division, Dept. 81-92
Niagara Falls, New York

Please send me Form A-1523 which tells me about Cup Wheels with "Built-In" Guard.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

81-92

tecting the chromium from oxidation, the silicon also improves chromium recovery to as much as 90 per cent or higher.—**Union Carbide Metals Co.**, division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 486—Page 53

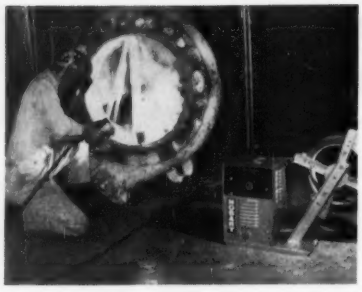
POWER SOURCE

SR-1000-A1 power source delivers 1000 amp of direct current at 40 volts on 100 per cent duty cycle. It is used with three-phase power lines. Single current range adjusts output from minimum of 200 amp to maximum of 1600. The unit has been used as the power source for heavy submerged arc welding, gouging operations, and for some electric furnace applications. It requires less than 9 sq ft of floor space.—**Miller Electric Mfg. Co.**, Appleton, Wis.

For More Details Circle No. 487—Page 53

PORTABLE WELDER

Handomatic semiautomatic portable welder is designed for either open arc hard surfacing or submerged arc welding. A universal wire feeder for hard surfacing, build up, and mild steel welding uses tubular (fabricated) wires or solid



wires. The unit can be connected to almost any welding machine, either ac or dc, by connecting the welding cables and one ground wire.

A single rheostat controls wire-feed speed. At nominal 30 volts, the wire-speed range is 60 to 260 ipm, and an optional gearbox provides 90 to 460 ipm.—**Hobart Bros. Co.**, Troy, Ohio.

For More Details Circle No. 488—Page 53

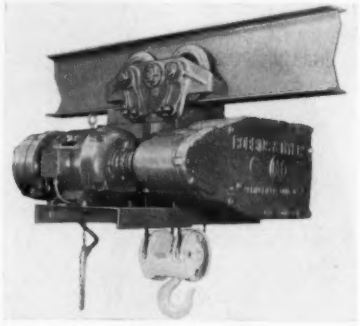
AIR FLOW SAFETY SWITCH

Low-pressure Airflow safety switch can be used to supervise air flow on fan suction or discharge ducts of paint finishing and other processing systems. Designed for flat mounting in remote locations or near the equipment involved, the unit acts quickly if anything interferes with the desired flow of air from the fans. It also can be used to actuate alarms in areas where controlled ventilation is required.—**R. C. Mahon Co.**, E. Eight Mile Road, Detroit 34, Mich.

For More Details Circle No. 489—Page 53

ELECTRIC HOISTS

Line of Type F3 electric hoists is available in capacities from 1½ through 7½ tons. These units require unusually low headroom—only 24 in. for the 5-ton model, for example. Motor and control box are totally enclosed and weath-



ertight; addition of an inexpensive diaphragm at the pushbutton station makes these hoists suitable for outdoor use.

Power is supplied by a 7½-hp, 30-minute, 55° C rise motor with magnetic, weatherproof brake. A four-position, weight-operated limit switch protects hoist and operator. Extra-large diameter cable drums increase lift and reduce the effect of bending in the hoisting cable. All load gears, pinions, and shafts are made of alloy steel.—**Robbins & Myers Inc., Hoist & Crane Div.**, Springfield, Ohio.

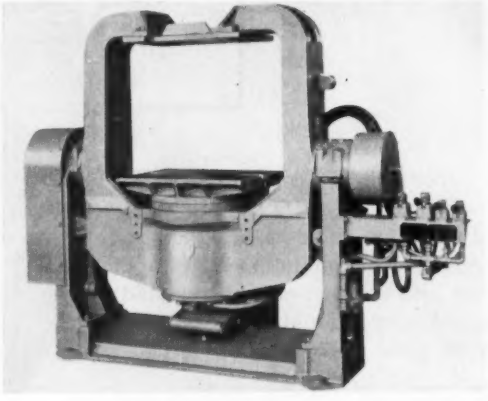
For More Details Circle No. 490—Page 53

COATED ABRASIVE DISCS

Coated abrasive discs produced by process known as Magnecoating are said to possess up to 200 per cent longer life, two to four times greater particle density, and more efficient cutting action. The process magnetically orients abrasive particles so that they are firmly embedded in the adhesive coating with the sharpest points up.

A dense coating of the entire disc surface is assured, and excess loose particles are removed from the coated disc by magnetic force. The discs are coated after cutting. They are available in standard grits

Machine Produces Compact Green Sand Molds

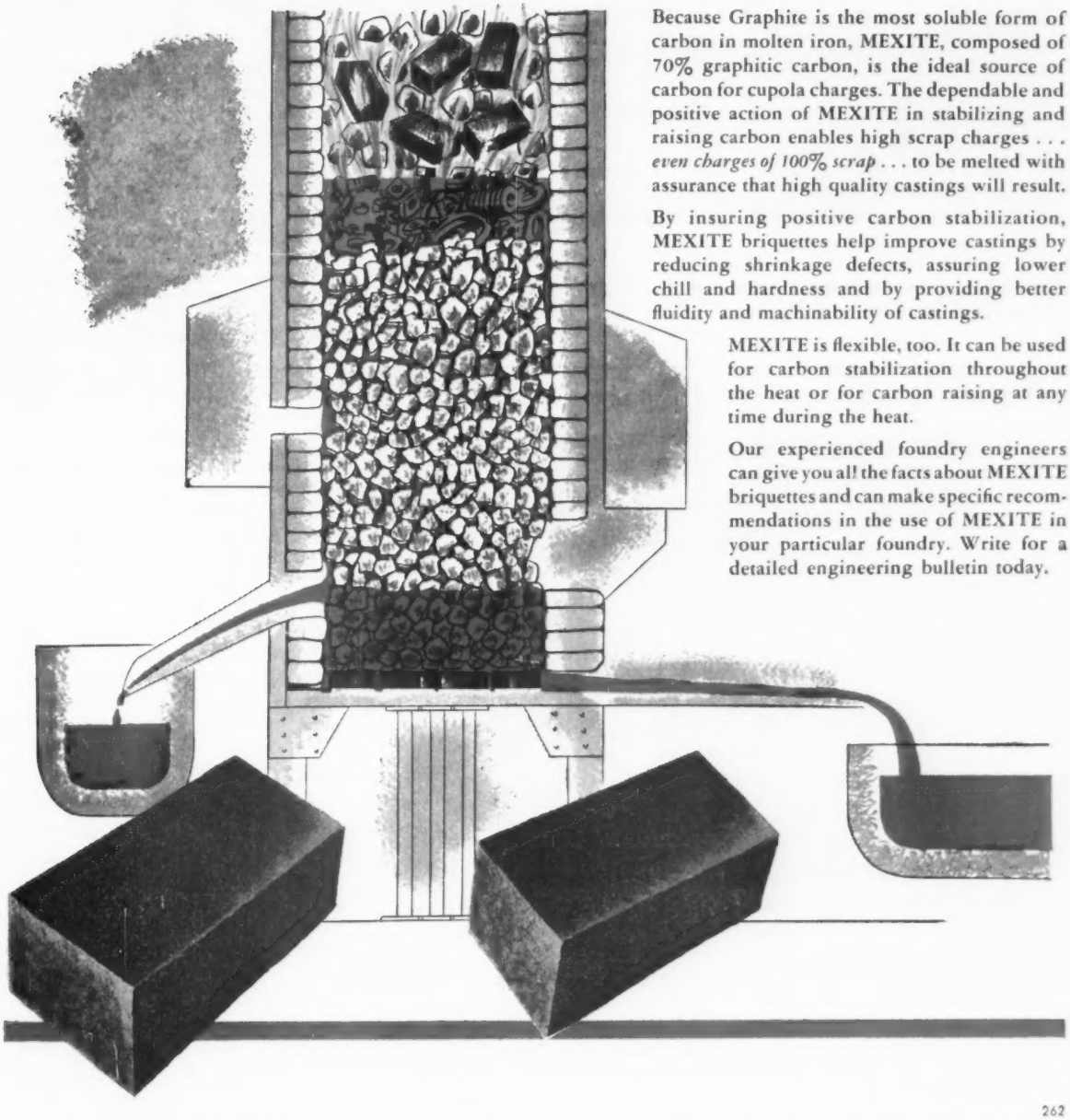


Model 9646 jolt-squeeze-roll-over draw machine with high squeeze power is said to permit better compaction of green sand molds, increase production, and lower costs. It features 1500-lb jolt capacity and 21,000-lb squeeze capacity on standard 80-psi line pressure. The 21,000-lb squeeze is achieved by using the areas of the jolt piston and the squeeze piston in combination. Pattern draw is 12 in.., and the squeeze stroke is 12½ in.

The unit's anvil frame and trunnions are steel castings, heat treated and reinforced at key stress points. The unit is equipped with a power rollover cylinder and smooth rollover action. A heavy-duty power brake helps the operator position the jolt table at intermediate points for easier flask loading. A valve control permits jolts ranging from a light tap to a heavy blow. —**SPO Inc.**, 6449 Grand Division Ave., Cleveland 25, Ohio.

For More Details Circle No. 502—Page 53

YOU CAN CHARGE MORE SCRAP IRON AND GET HIGH QUALITY CASTINGS WITH MEXITE® (GRAPHITE BRIQUETTE)



Because Graphite is the most soluble form of carbon in molten iron, MEXITE, composed of 70% graphitic carbon, is the ideal source of carbon for cupola charges. The dependable and positive action of MEXITE in stabilizing and raising carbon enables high scrap charges . . . *even charges of 100% scrap* . . . to be melted with assurance that high quality castings will result.

By insuring positive carbon stabilization, MEXITE briquettes help improve castings by reducing shrinkage defects, assuring lower chill and hardness and by providing better fluidity and machinability of castings.

MEXITE is flexible, too. It can be used for carbon stabilization throughout the heat or for carbon raising at any time during the heat.

Our experienced foundry engineers can give you all the facts about MEXITE briquettes and can make specific recommendations in the use of MEXITE in your particular foundry. Write for a detailed engineering bulletin today.

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THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDER METALLURGY • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Circle 613 on Page 53

for all normal grinding and finishing operations. — **Abrasives Co. of America**, 492 Main St., Fort Lee, N. J.

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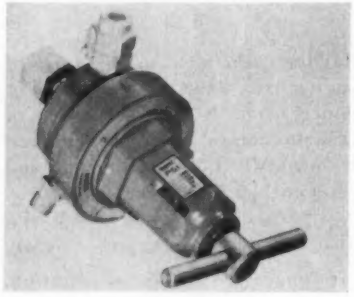
GAS REGULATORS

Oxweld gas regulators without gages cost less and eliminate time and cost required to replace broken



gages. R-550, R-551, and R-552 models are for use respectively with oxygen, acetylene, or propane on cylinders or manifolds. These large-capacity, single-stage regulators have stem-type valves and are designed with a minimum of exposed parts. Delivery pressures are calibrated on an anodized aluminum plate on the cap of the device, and pressure is shown by an indicator running in the slot alongside the calibrated reading. Cylinder pressure is shown by a metal indicator unit on the regulator body.—**Linde Co.**, division of Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y.

For More Details Circle No. 492—Page 53

VIBRATING SEPARATOR

Vibrating-type separator screens and separates barrel-finished parts and abrasive media. A vibrating unit imparts high-frequency, low-amplitude vibrations to the screening mechanism. Screening surface of the bed is 18 in. wide and 48 in. long. The machine is equipped

with three screens for most standard separating operations and is powered by a 220/440-v, three-phase, 60-cycle alternating-current motor. No holding bolts are required to prevent walking because the vibrating unit is completely shock mounted.—**Roto-Finish Co.**, Kalamazoo, Mich.

For More Details Circle No. 493—Page 53

DIECASTING POURING LADLES

Stainless steel pouring ladles for the diecasting industry are made in 23 different sizes. Fifty per cent lighter than conventional ladles, they also have high resistance to burn-out. They are shot blasted for good coating adhesion, but can be used without coating for such metals as zinc, lead, and kirksite. Two types are available—one with full handle, the other with stub handle to fit standard pipe. The company also manufactures stainless steel skimmers. — **Spincraft Inc.**, 4135 W. State St., Milwaukee, Wis.

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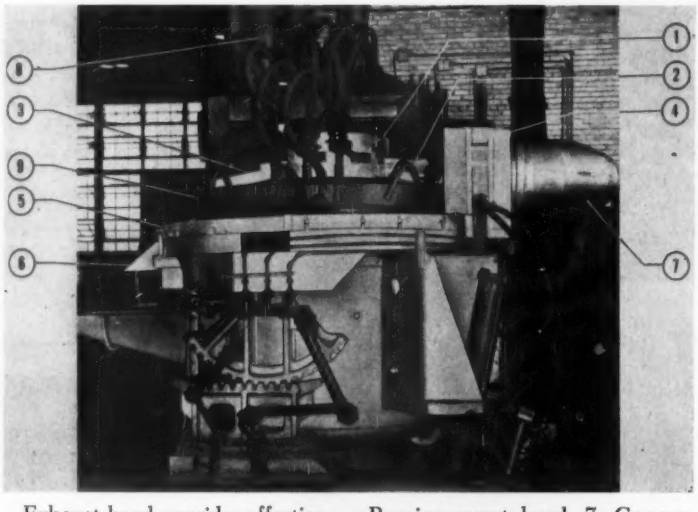
SAFETY SWITCH

In the event of pilot-flame failure, Model SBS safety switch goes into action automatically and shuts down both pilot and main fuel flow in 30 to 45 seconds by actuating a solenoid switch. Under normal operating conditions, a mercury-filled bulb, installed close to the pilot flame, is heated to a bright red. The switch remains in a depressed condition, allowing uninterrupted flow of fuel. An indicating dial shows that normal operation is proceeding. If the pilot flame is extinguished, the mercury vapor in the bulb condenses, interrupting the circuit to the solenoid valve or other devices. At the same time, an indicating needle drops, showing that

Hood Exhausts Electric Melting Furnaces



Exhaust hood provides effective dust, fume, and smoke control for electric melting furnaces. Simple in design, it operates with reduced air volume and minimum interference with charging, pouring, or other furnace operations.

Key parts are shown here, in this view of a hood installed on a 3-ton furnace: 1. Electrode hood. 2. Connecting duct. 3. Electrode hood supports. 4. Distribution section and slag spout hood. 5. Manifold ring and baffle. 6. Pouring spout hood. 7. Connection to exhaust system. 8. Electrodes. 9. Furnace roof.

Depending on the size and type of furnace involved, air volumes are expected to run 15 to 40 per cent less than those required with roof-mounted hoods. This reduction can result in proportional reduction in the initial cost of cleaning equipment as well as in operating costs. — **Pangborn Corp.**, Hagerstown, Md.

For More Details Circle No. 503—Page 53

No.8® GRAPHITIZER

TREATS GREY IRON EFFECTIVELY FOR LESS THAN 10¢ PER TON!

Thousands of foundries are already employing No. 8 because it is such an amazingly simple and accurate graphitizer. No. 8 is a powerful inoculant. It plants graphite *throughout* the molten metal. No. 8 gives castings a higher machinability rating. It reduces chill and hardness in thin sections and improves wear and shock resistance. No. 8 makes castings more metallurgically uniform and, most important of all, No. 8 graphitizer *substantially reduces the cost of metal control* (cost figures in several foundries are below 10¢ per ton of metal treated). No. 8 is easy to apply by funnel or envelope method. As the photomicrographs shown here indicate, No. 8 is effective for special metallurgical control. From every standpoint it will pay you to use No. 8, regularly. For further details write for Engineering Bulletin No. 2.

Base Iron

Photomicrograph from broken half of 1.25 arbitration bar of gray iron not treated with No. 8 Cupola charge was made up of 48% steel, 33% cast scrap, 19% malleable pig iron and 45 lbs. of silicon briquettes. Total charge was 2544 lbs. This iron tested to the following physical properties: Transverse Strength 2,497 lbs. (wedge bar) • Brinell Hardness 229 (wedge bar) • Total Chill Depth 41/32 in., Clear Chill 26/32 in. • Deflection 0.23 in.

Treated Iron

Photomicrograph from broken half of arbitration bar of same base iron treated with 1 lb. per ton of No. 8. Holding time in ladle following addition of Graphite was less than 8 minutes. Note how the addition of No. 8 has destroyed the dendritic pattern and has given a normal flake pattern. The treated iron tested to the following physical properties: Transverse Strength 2,970 lbs. (wedge bar) • Brinell Hardness 217 (wedge bar) • Total Chill Depth 13/32 in., Clear Chill 10/32 in. • Deflection 0.31 in.

Note how the iron treated with No. 8 has increased in deflection. Usually iron treated with No. 8 will show an increase from 10% to 30% in deflection over the base iron value—this means less cracked castings and more serviceable metal.

GF240-1

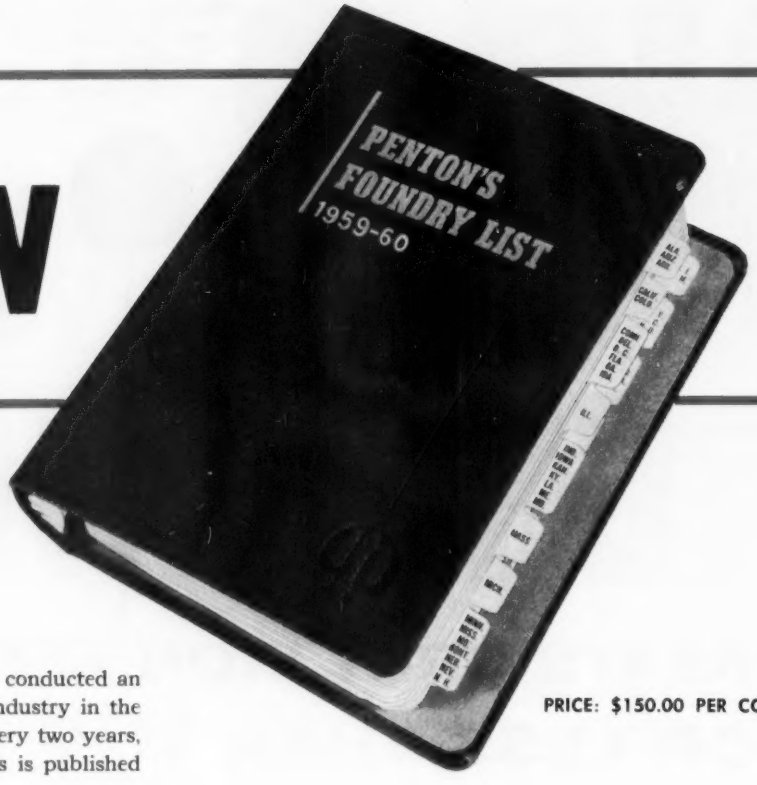
THE UNITED STATES GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 14, MICHIGAN

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES

Circle 614 on Page 53

NEW



For many years, FOUNDRY has conducted an intensive census of the foundry industry in the United States and Canada . . . every two years, basic information on all foundries is published in . . .

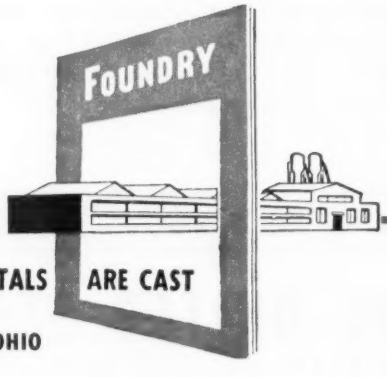
PRICE: $150.00 PER COPY.

PENTON'S FOUNDRY LIST and DIRECTORY

The new 1959-60 edition of PFL will soon be available (expected publication date, July 15). The new directory will give comprehensive information on all the 6,000 metal casting plants in the U. S. and Canada (including die casters). It will tell who they are and where they are located; what metals they cast, their melting equipment capacities, departments operated, etc.,

Well-indexed, and in loose-leaf form, PFL is indispensable to casting buyers and foundry suppliers. Send your order to: Book Department, FOUNDRY, 1213 West Third St., Cleveland 13, Ohio.

ORDER *NOW* FOR JULY DELIVERY



Helping You Sell To Foundrymen

WHEREVER METALS ARE CAST

A PENTON PUBLICATION, PENTON BUILDING, CLEVELAND 13, OHIO

the pilot flame is out. — **Partlow Corp.**, 517 Campion Rd., New Hartford, N. Y.

For More Details Circle No. 495—Page 53

INDUSTRIAL TRUCKBRAKES

Tri-Safe braking system for the company's industrial trucks with capacities from 15,000 to 100,000 lb is said to incorporate the safety and control features of three completely independent brakes. These include a dynamic brake which uses the drive motor as a generator to provide braking action and serves to slow the truck down quickly; a power-operated hydraulic brake in each drive wheel for normal service braking; and a mechanical brake for emergency stops and parking. All three brakes are actuated by a single toe-bar which extends the entire width of the operator's compartment. Approximately 75 per cent of the braking effort is applied electrically, thus increasing brake shoe life four times.—**Elwell-Parker Electric Co.**, 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 496—Page 53

ECONOMY-MODEL LOADER

Model 210 utility loader is an economy model which lifts 1000-lb bucketfuls to 10 ft 5 in. in seconds. It dumps clean at 45 deg and has 30-in. reach and 8-ft-5-in. clearance. Its 11, 13, or 18-cu-ft buckets cut 5 in. below grade, roll back 17 deg, and tilt forward 90 deg. The loader's 1300-psi hydraulic power is controlled by feathered valves which include lift, lower, hold, and float positions. A variety of attachments can be installed in five minutes.

Construction features include a 4-cyl, 34-hp engine, a four-speed forward transmission, and 100 per cent antifriction bearings.—**J. I. Case Co.**, Racine, Wis.

For More Details Circle No. 497—Page 53

SKID-RESISTANT FLOORS

Powder and a liquid binder have been developed to resurface floors, stairs, ramps, metal catwalks, and stair treads. The product, called Stoncap, is stated to have high antislip qualities, to be long lasting, and to resist greases, oils, fats, brines, and alkalies. Lightweight and resilient, it is ready for foot traffic in as little as 5 hours and for truck traffic in 24 hours. It can be applied on wet surfaces and is available in maroon, gunmetal, light or dark green, and light gray.—**Stonhard Co.**, Dept. 130, 1306 Spring Garden St., Philadelphia 23, Pa.

For More Details Circle No. 498—Page 53

Applicator Simplifies Degassing with Lithium

● LITHIUM DEGASSING of copper melts has been simplified greatly by the introduction of a new applicator. Designed as an effective means of submerging and stirring in lithium cartridges (hermetically sealed copper jackets filled with lithium metal), the applicator is the result of co-operative studies by Lithium Corp. of America and Becker Brothers Carbon Co.

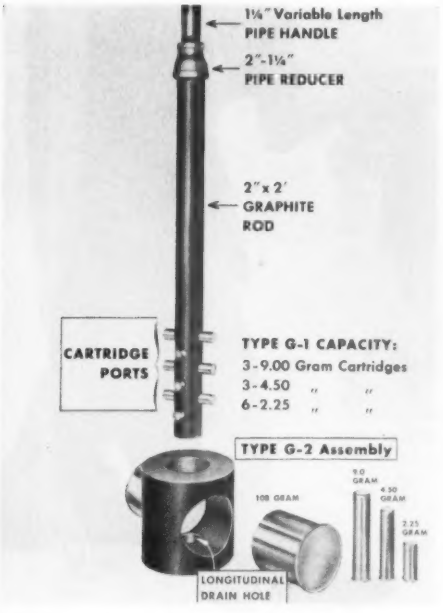
The lithium copper cartridge was developed by LCA ten years ago to add flexibility and convenience to the addition of lithium to molten metal. The present design was introduced last year and offers an all-purpose tool for melts ranging from 50 to 5600 lb. The principle also can be adapted to special conditions.

The applicator is molded of graphite and consists of a 2-in.-diam rod bored transversely to hold standard 2¼, 4½, and 9-gram cartridges. An assembly model includes receptacles for 108-gram cartridges. The rods are threaded for attachment of standard pipe fittings as handle extensions.

Lithium, the lightest of all metals, is an effective degasser because it reacts readily with nonmetallic elements and is insoluble in most of the base metals. Where good melting control is practiced, it is claimed, lithium eliminates oxygen and reduces sulfur, nitrogen, phosphorus, and hydrogen. This action in turn reduces porosity and inclusions. Lithium also is said to improve fluidity of the melt and the malleability, tensile strength, ductility, and elongation of treated metal.

Its most common application has been in the treatment of copper, but it also is used to advantage with ferrous melts, particularly stainless steels and ductile iron.

For More Details Circle No. 504—Page 53



Left—Applicator and, at bottom, the receptacle for 108-gram cartridges. Above—Lithium copper cartridges and applicator are used to degas a melt

Circle 641 on Page 53

To the who wants of

MOLDING MACHINES

Foundryman a bigger share the business

OSBORN ROTA-LIFT® keeps your quotes competitive . . .

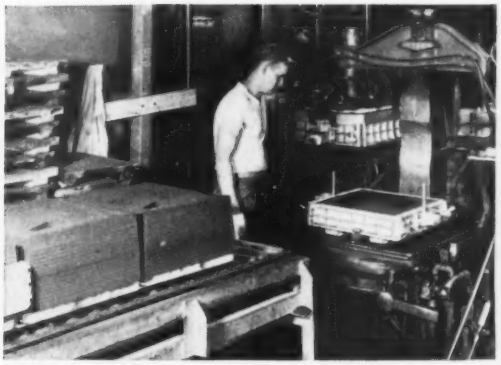
helps you handle a wider range of jobs . . . at a profit

Molding from large match-plate patterns today with an Osborn *Rota-Lift®* means a *mechanized* operation that pays off in better castings . . . at lower cost.

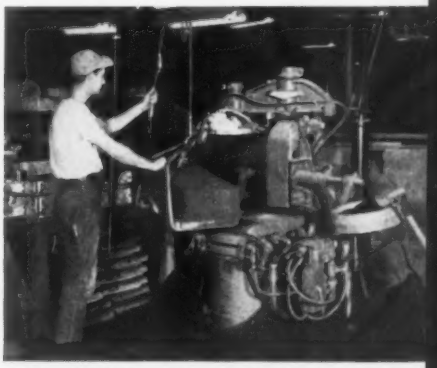
One man . . . one *Rota-Lift* machine easily handle all five major match-plate molding operations—jolt . . . roll . . . squeeze . . . draw . . . and close. Able to handle a wide range of flask sizes, *Rota-Lift* machines are also quickly adjustable for rapid short-run job changeovers.

The *Rota-Lift* is ideally suited and a real asset to any jobbing or semi-production foundry. An Osborn Sales-Engineer will recommend the right model *Rota-Lift* to improve your competitive position . . . for a *bigger* share of the business now. Call him in—or write: *The Osborn Manufacturing Company, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

WRITE FOR YOUR COPY of *Rota-Lift* folder No. 25-A. Includes complete specifications, operating data, applications and design features on the Osborn *Rota-Lift* molding machine line.



OSBORN ROTA-LIFT producing under overhead sand hopper and telescopic conveyor for mold set-off.



OSBORN ROTA-LIFT producing with floor sand and jib-crane for mold set-off.

MEMBER FEMA

leader in mechanization for the foundry

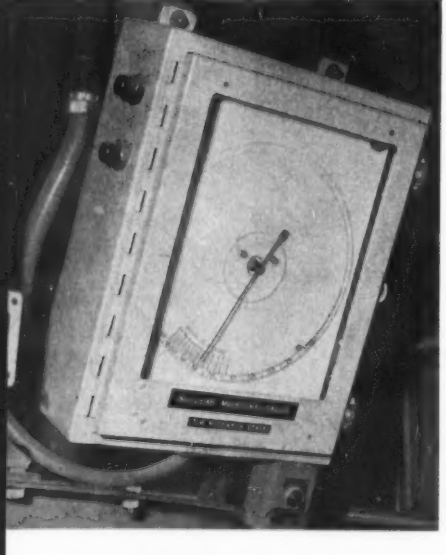
OSBORN®

CORE BLOWERS • SHELL MOLDING MACHINES • BRUSHING MACHINES • INDUSTRIAL BRUSHES

Circle 612 on Page 53

Milton J. Diamond, right, Central Foundry Div. research engineer, and Harvey A. Burley, GM Research Laboratories, discuss neutron detectors for moisture gage

Neutron Detector Controls Sand Moisture



Nuclear moisture gage dial automatically shows how much water will bring sand to desired value

● PLUTONIUM-239, a primary ingredient of A-bombs and nuclear reactors, is being used to measure the moisture content of molding sand at General Motors' Central Foundry Division plant in Danville, Ill. It is believed to be the first industrial application of its kind.

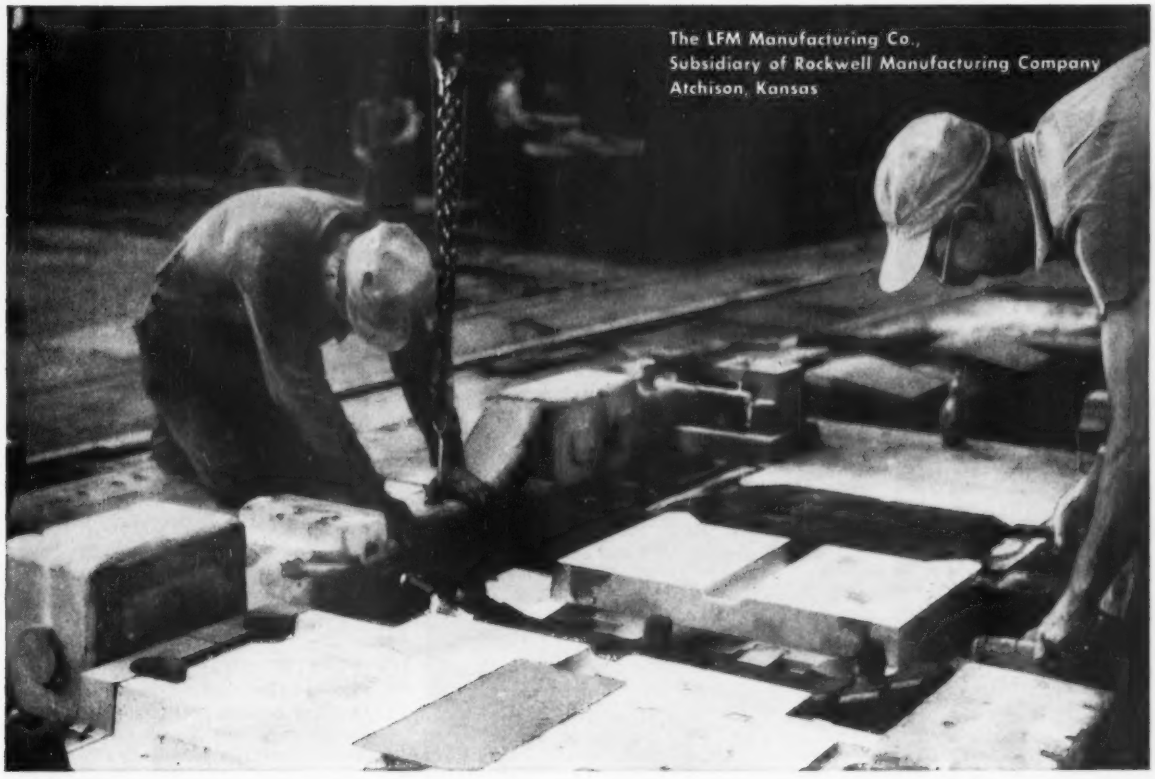
Developed jointly by GM Research Laboratories and Central Foundry engineers, the technique utilizes fast neutrons emitted from 32 grams of plutonium mixed with beryllium powder and sealed in a stainless steel capsule. Fast neutrons collide with hydrogen nuclei in water atoms in the sand, producing slow neutrons that can be counted electronically. Number of slow neutrons is directly proportional to the sand's moisture content.

"This new sand moisture gage," according to James H. Smith, Central Foundry general manager, "has substantially improved our ability to make sand molds of uniformly high quality. It permits us to maintain a more exact moisture content than ever before and is expected to correct substantially a variety of foundry problems."

Before the nuclear device was installed, moisture control depended on an experienced operator's hand test or "feel" of the sand. Added water in the mulling process depended on judgment. Also, hopper sand samples were spot checked on laboratory equipment, but this took time while sand batches were mulled.

Calculation Is Rapid—The new gaging is almost entirely automatic. The neutron source pellet of plutonium-beryllium powder is lowered through a stainless steel tube into the center of each 3200-pound batch of molding sand in the hopper.

The slow neutrons, resulting



Largest Electric Steel Foundry Casts Cities Service in Major Role

The LFM Manufacturing Company, Inc. praises "remarkable versatility" of Cities Service Core Oils

Today, a typical sampling of the work at The LFM Manufacturing Company might include: a one-piece railroad truck casting, 20 feet long and eight feet wide . . . giant 13,000 pound crankcase castings for 16-cylinder diesel generators . . . or intricate pump castings.

As might be expected, all of this requires one of the largest core rooms, covering 20,000 square feet of area, with 13 huge core ovens, scores of coremakers and a good many core oils.

But what fascinates LFM is not how many but *how few* different core oils they require, considering their vast production. Here they're quick to praise the remarkable versatility of Cities Service Delco #938.

For at LFM, Cities Service Delco #938 is used in a surprisingly wide range of core applications with equally satisfactory results. Cores for the largest railroad casting or the smallest pump part are frequently made with this same oil.

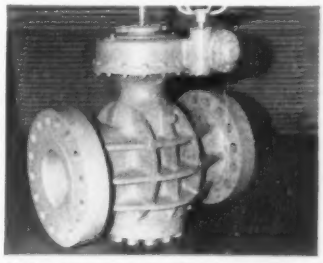
Cities Service Core Oils provide this versatility because they can stand the long baking necessary for large cores and give the fast bake so vital to small cores. Shakeout properties are always excellent; smoke is minimal.

If you're looking for core oils of high quality and wide application, talk with a Cities Service Core Oil Specialist. Call the nearest office or write: Cities Service Oil Company, 20 N. Wacker Drive, Chicago 6, Ill.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

Sandslinger is employed at LFM to swing out over giant molds and blast sand into them. Machine has capacity of 60 tons of sand per hour.



High Pressure Valve Body exemplifies diversification. LFM now makes parts for steel rolling mills, rock crushers, electric generators, as well as railroad parts. Cores for many are made with one oil – Cities Service Delco #938.

Circle 617 on Page 53

FOUNDRIES MATERIALS COMPANY
CO_2 EQUIPMENT • BINDERS • FACINGS • SANDS •
CLAYS • REFRACTORIES • FOUNDRY EQUIPMENT
Manufacturers of KORWELD COREPASTE & MASTERMIX WASHES
COLDWATER, MICHIGAN. BRoadway 8-5668
DETROIT, MICHIGAN. 2055 W. Grand Blvd. TYler 8-8115
Professors of Foundryology
Circle 618 on Page 53

from collisions with the hydrogen nuclei, are electronically counted by two neutron detectors in the tube with the neutron source. From the count, which is completed in about 45 seconds, there is rapidly calculated (1) percentage of existing water in the batch, and (2) the exact amount of water to be added to maintain a predetermined level.

Moisture content is indicated on a large dial, which also shows quantity of water needed. The muller operator pushes a button to drop the sand from hopper to muller. With a second button, he meters the desired amount of water into the muller.

Meanwhile, the nuclear device resets itself to begin counting slow neutrons in the next batch of sand. This checking of every batch reduces human error and assures close limits of moisture content all the time. It is not a sampling method.

Accuracy of the sand moisture gage is better than plus or minus 0.05 per cent by weight over a range of 2.5 to 5.0 per cent total moisture content.

Plutonium-239 was obtained under special nuclear material license from the Atomic Energy Commission authorizing use of the plutonium-beryllium source under prescribed operating conditions. Even more rigid safety precautions were specified by General Motors' industrial hygiene section.

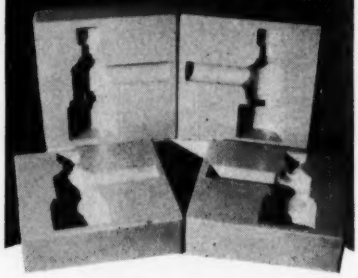
Safety Measures—Operating personnel are protected by regularly checked film badges, keeping any radiation absorption well within safe limits.

When not in use, the source is contained in a wax neutron absorbing shield. Similar shielding surrounds the hopper, providing full protection when the source is in the sand. The sand is not contaminated during the moisture check and is completely safe for handling thereafter.

This is believed to be the first AEC-authorized foundry application of plutonium, which was selected because of its long life. Plutonium atoms disintegrate, emitting alpha particles which interact with beryllium to form the fast neutrons. The plutonium's estimated half-life is 24,300 years.

Milton J. Diamond, research en-

Plastic Steel
80% STEEL
SAVES 49 HOURS MAKING THESE CORE BOXES



PLASTIC STEEL . . . originally developed for making tools, jigs and fixtures in metalworking plants . . . brought a revolutionary new method to this leading foundry* . . . chopping hours off the time required to produce core boxes, molds, duplicates of wood and metal patterns. Tremendous savings are being shown daily . . . making low cost patterns, repairing and altering patterns, filling large or small blow holes in ferrous and non-ferrous castings, repairing and rebuilding machinery, and many other applications.

PLASTIC STEEL becomes a strong, tough, metallic mass (similar to steel) within 2 hours after addition of the special hardening agent. Once hard, PLASTIC STEEL can be drilled, tapped or sawed with metalworking tools. PLASTIC STEEL is non-shrinking, non-expanding . . . adheres to ferrous and non-ferrous metals, wood, glass and many other surfaces.

* Name on request.

SAVE UP TO 75% in time and costs over conventional methods of pattern-making with Plastic Steel

Prove these figures to yourself. Write for the DEVCON Foundry Bulletin.

Ask for new bulletin describing DEVCON F-2, Liquid Aluminum for making patterns, molds and core boxes.

TECHNICAL REPRESENTATIVES AND DISTRIBUTORS IN ALL MAJOR CITIES

DEVCON CORPORATION
126 ENDICOTT STREET, DANVERS, MASS.
Circle 619 on Page 53

gineer for Central Foundry Division, proposed the use of radioactive material for gaging moisture. He was a member of the first group of six men to complete the GM Research Laboratories Radioisotope Training School.

The first gage was developed and built by Harvey A. Burley of GM Research Laboratories' physics department, who teamed with John P. Danforth, Robert E. Black, and Arthur Block, GM Technical Center.

Door Hinge Redesign Wins Malleable Founders' Contest

Winning entry in the 1959 Malleable Founders' Society Redesign and Conversion Contest was the redesign of an automobile door hinge from rolled steel to ferritic malleable iron.

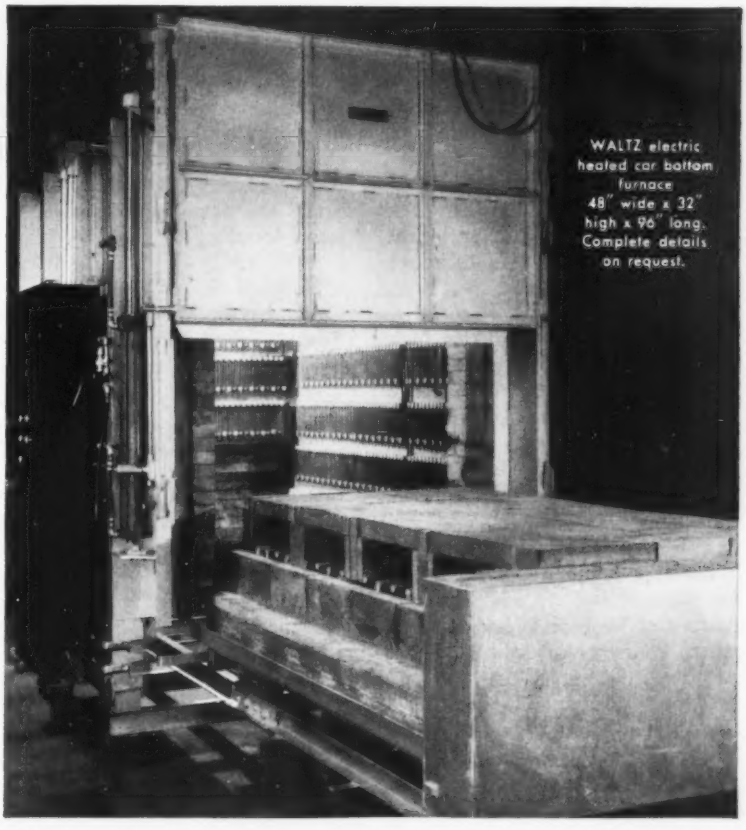
P. C. Potter and C. D. Evans, Central Foundry Div., General Motors Corp., Saginaw, Mich., submitted the first-prize winner. As a result of this conversion, front door male strap hinges on all 1959 General Motors cars now are malleable castings. This application uses 1500 tons of malleable a month.

Dale Evans (left) and P. C. Potter, Central Foundry Div., General Motors

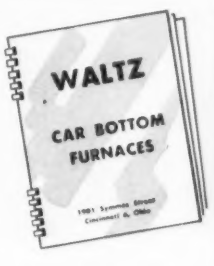
The cast hinges are produced with equal or greater strength than that of the rolled steel parts, but with less weight and at lower cost. In addition, a shearing operation and a subsequent forming operating have been eliminated, and machining is greatly improved.

Other winners in the contest were Joe W. Beckham, Texas Foundries Inc., Lufkin, Tex., second prize; Mr. Beckham and Neal Maranjo, Texas Foundries, third prize; John L. Bill, Lehigh Foundries Co., Easton, Pa., fourth prize; John H. Benko Jr., Peoria Malleable Castings Co., Peoria, Ill., fifth prize; and Dale E. Holmes, Albion Malleable Iron Co., Albion, Mich., sixth prize.

only 3° variation in temperature inside this Waltz furnace



A large automotive company required an electric heated car bottom furnace in their foundry operation that would deliver a *uniform* temperature in *every* part of the furnace, with a maximum variation of no more than 10 degrees. Heat treating large numbers of high alloy castings in the furnace at the same time made this a rigid requirement. This Waltz furnace built for this job, cuts 7 degrees off this requirement, delivers a uniform temperature, with no more than a 3 degree variation in all sections of furnace. This heat treats each piece exactly the same, resulting in a higher quality, more standardized product. This example of Waltz temperature control is outstanding, but all Waltz furnaces are designed to achieve, as nearly as possible, the same high standard of uniformity.



Waltz Furnace Company
Dept. E, 1901 Symmes St., Cincinnati 6, Ohio
Please send me without obligation this new 33 page illustrated book, with photos and technical description of this furnace and 13 other WALTZ car bottom furnaces.
NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE_____

Waltz FURNACE COMPANY
Symmes Street • Cincinnati, Ohio

Circle 620 on Page 53

Industry Briefs

Griffin Pipe Div., Griffin Wheel Co., Chicago, has begun construction of its cast iron pressure pipe foundry at Council Bluffs, Iowa, and expects completion of the project by the end of the year. The plant will manufacture pipe by the Delavaud process, in sizes 4 through 12 in. in 20-ft lengths.

Vanadium Corp. of America, New York, and Keokuk Electro-Metals Co., Keokuk, Iowa, will effect a merger within a few weeks. Keokuk will be continued as a division of Vanadium, and its products will be distributed under their present tradename.

Foundry Equipment Ltd., Leighton Buzzard, Bedfordshire, England, has set up its fourth overseas company, Foundry Equipment (South Africa) (Pty) Ltd., Western House, Booysens Road and Trump Street, Selby Johannesburg, South Africa. The company's other overseas organizations are in Australia, Spain, and Canada. The Canadian firm is F. E. (North America) Ltd., Toronto, Ont., Canada.

J. H. France Refractories Co., Snow Shoe, Pa., has completed negotiations with Tokyo Kogyo Boyeki Shokai Ltd. for distribution and sales of France products in Japan. The Japanese firm has offices in 14 major Japanese cities.

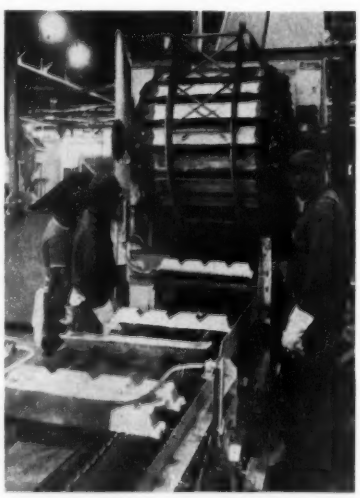
Parkersburg Rig & Steel Co. has announced it will close its gray iron foundry at Pomeroy, Ohio, which it has operated since 1921.

Archer-Daniels-Midland Co.'s Cleveland plant has received a National Safety Council Certificate of Commendation for achieving 427,424 injury-free manhours from April 11, 1956, to Dec. 31, 1958.

American Steel Foundries, Chicago, will purchase the entire assets and business of South Bend Lathe Works, South Bend, Ind., subject to approval of South Bend stockholders at a special meeting June 9. South Bend manufactures precision metalworking lathes and other machine tools and accessories. It will be operated as a subsidiary of ASF under the same name and at the same location.

National Supply Co., Torrance, Calif., has been presented the National Safety Council's highest recognition, the Award of Honor. The award is based on the plant's low injury rate during 1958. The injury frequency rate was 91 per cent better than the company's "par" rate, and its injury severity rate was 86 per cent better. This award is in addition to an Award of Merit received by the plant for more than 1 million manhours of accident-free operation.

Twin City Monorail Co. is the new name of the former Vern G. Ellen Co., 2123 Broadway N. E., Minneapolis, Minn. The firm manufactures monorail equipment and crane systems under the tradename Twin City Monorail.



NEW SMELTER: Aluminum alloy ingots tumble off one of the three casting lines at American Smelting & Refining Co.'s new Alton, Ill., smelter. Said to be largest of its type, annual capacity is 36,000 tons

Fenwick Machinery Inc., Route 46, Caldwell, N. J., has been appointed by Koehring Co., Milwaukee, to distribute Koehring, Parsons, Kwik-Mix, and Ka-Mo products in 12 New Jersey counties.

Ohio Ferro-Alloys Corp., Canton, Ohio, has placed in operation the last of three large electric furnaces at its new plant at Powhatan Point, Ohio. Major product at the new facility is silicon metal. The company operates two other plants in Ohio and one at Tacoma, Wash.

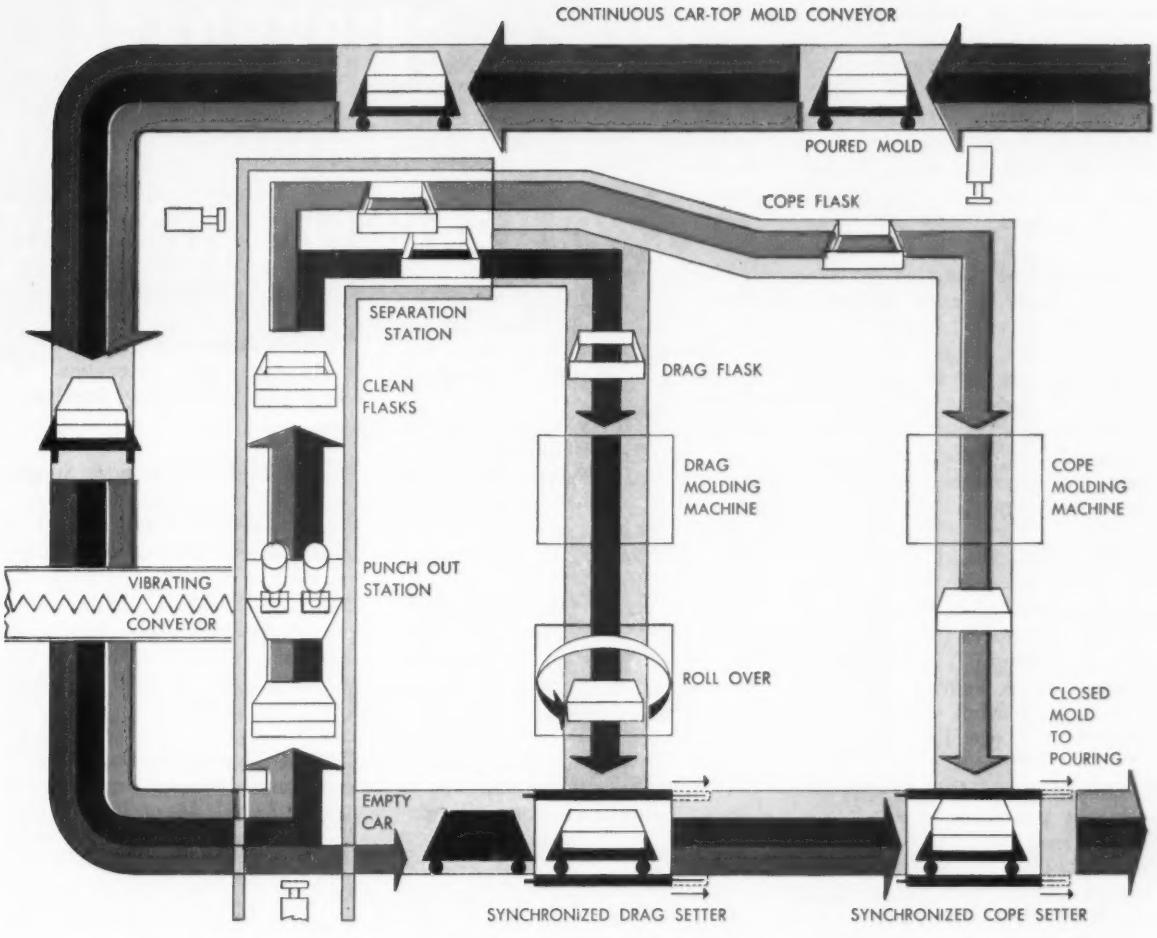
W. W. Sly Mfg. Co., Cleveland, has appointed Sinclair-Brandt Equipment & Supply Co., 6620 Dixie Drive, Houston, Tex., to handle sales and service of its dust control systems, industrial ovens, blast cleaning equipment, and tumbling mills in Texas. Devlin Brothers, 1003 Maritime Bldg., New Orleans, have been appointed Sly's representative in Louisiana.

Diamond Alkali Co., Cleveland, will construct a multimillion-dollar research center in Concord Township, Ohio, near Painesville. The center will include a 72,000-sq-ft research laboratory, a 35,000-sq-ft laboratory and office building, a high-pressure laboratory, offices, and auxiliary buildings. They will be built on an 800-acre site.

Pioneer Rubber Co., Willard, Ohio, has named Conney Products Co., Fond du Lac, Wis., to distribute its complete line of industrial glove products in Wisconsin, Minnesota, Illinois, and Indiana.

American Cast Iron Pipe Co., Birmingham, has added a line of ductile iron pipe, tubing, casing, and special castings to its products. Three basic grades of ductile iron currently are offered.

Air Heaters Inc., 1004 Mahoning Bank Bldg., Youngstown 3, Ohio, has been formed to provide a service that begins with basic heating



NEW AUTOMATIC MOLD HANDLING SYSTEM

...ANOTHER EXAMPLE OF PLANET VERSATILITY

This new Planet automatic mold handling system, installed in a large automotive foundry, is another example of how *Planet Versatility* saves time and money, and increases efficiency and production. The system automatically guides 300 molds per hour through a complete casting cycle . . . *and it will pay for itself in less than one year.*

HERE'S HOW IT WORKS:

After molding, the drag flask (center of diagram) is rolled over 180 degrees and with split-second timing is positioned on a continuously moving car-top mold conveyor. Next, it is conveyed to where the completed cope, without stopping the line, is gently and accurately placed on the drag. The closed mold is then poured, the only manual operation on the line.

The poured mold continues on the car-top mold conveyor to where it is pushed onto the punch out station. Here the castings and sand are dropped onto a double-decked vibrating conveyor for disposition. The clean flasks then move to the separation station, are separated, and returned to their respective molding machines to be refilled and recirculated through the system.

Powered rollers throughout the system hold flask wear and damage to a minimum . . . there is no sliding contact on this Planet engineered system.

Custom designed systems, such as this automatic mold handling system, have helped build Planet Corporation's reputation as a *versatile* organization with solutions to perplexing production, materials handling and automation problems. Let Planet demonstrate how its "PV" engineering skill can help you . . . you'll find that *it pays to plan with Planet.*

PLANET CORPORATION

99

- Engineered Handling Systems
- Automation Equipment
- Mill & Foundry Handling Equipment

1818 SUNSET AVENUE
LANSING, MICHIGAN

Circle 621 on Page 53

and includes all design and construction work for a wide range of standard heated air applications and complete engineering of special heating systems. Officers are Arthur A. Olson, president; T. F. Schilling, treasurer; John Wehmhoff, secretary; and Lee Wilson, board member.

Midland-Ross Corp., Cleveland, has purchased all assets of Nelson Metal Products Co., Grand Rapids, Mich. Nelson, a producer of zinc and aluminum diecastings for the automotive industry, will operate under the direction of the Owosso, Mich., Div. of Midland-Ross. Business will be continued under present management.

Harris-Muff Inc., Kinnelon, Butler, N. J., has been formed to provide engineering advisory and assistance service to foundries and users of castings. It was formed by Spencer Harris, foundry consultant, and Tom C. Muff, formerly with Sorbo-Mat Process Engineers.

Ohio Injector Co., Wadsworth, Ohio, is producing a new line of ductile iron gate valves in sizes ½ to 2 in. They are rated at 1000 psi for all temperatures from −20° F to 650° F.

Hamilton Foundry Inc. is the new name of the former Hamilton Foundry & Machine Co., Hamilton, Ohio. The change was made to reflect the nature of its business and services more accurately. Hamilton also is beginning work on a $150,000 office addition and modernization program.

Ductile Iron Foundry of Rock Island Inc. has begun operations at 1400 Second St., Rock Island, Ill. Stanley Olson is president and Chester J. Richards vice president.

Kwik Mix Co., division of Koehring Co., Port Washington, Wis., has appointed Fincham Equipment Co., 1033 W. Mississippi Ave., Denver, Colo., to distribute all Kwik Mix trademark products.

Master Power Corp. is the successor to Master Pneumatic Tool Co., Bedford, Ohio. The company is a subsidiary of Black & Decker Mfg. Co., Towson, Md.

Al-Fin Div., Fairchild Engine & Airplane Corp., Deer Park, L. I., N. Y., has licensed Aluminum Industries Inc., Cincinnati, and Sterling Aluminum Products Inc., St. Charles, Mo., to use its Al-Fin process for molecular joining of dissimilar metals such as aluminum and magnesium to ferrous metals, nickel, titanium, etc.

Aluminum Association reports that primary aluminum production in the United States hit an all-time record rate during March, when it reached 157,189 tons for the month. The 456,013 tons produced during the first quarter of 1959 made that period the all-time record quarter.

Trenite Foundry Corp., Trenton, N. J., has ended operations. It was a producer of gray iron castings.

Baton Rouge Foundry & Supply Co., 875 Commercial Bldg., Baton Rouge, La., has been granted a charter of incorporation listing capital stock of $20,000.

U. S. Reduction Co., East Chicago, Ind., aluminum smelter, has opened an office at 4700 Crenshaw Blvd., Los Angeles.

Metal Treating Institute reports that March billings of its members reached $3,397,300, or 36.4 per cent more than the figure for the same 1958 month. First-quarter 1959 billings are 19.5 per cent more than those for the same period last year.

HOW To Do It

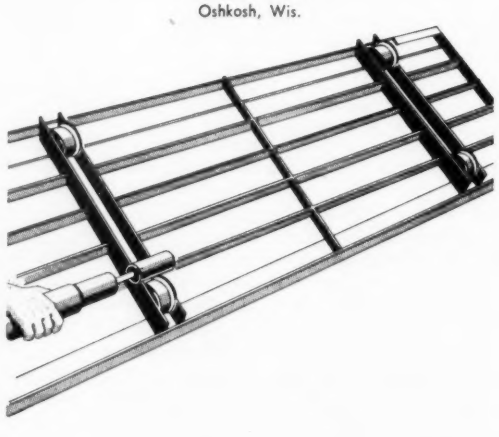
FOUNDRY will pay a minimum of $15 for each "How To Do It" idea submitted and published

Here's an Easy Way To Free Pallet Wheels

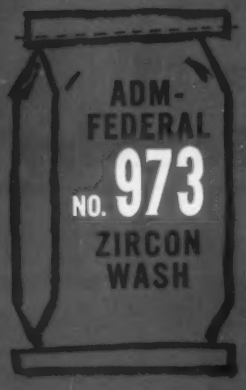
By J. PETERIK
Oshkosh, Wis.

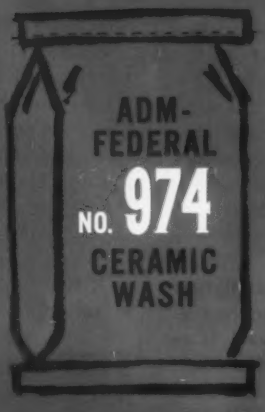
GROOVED wheels on mobile pallets often become corroded or jammed with dirt. They may be freed to roll as easily as when new by squirting a mixture of penetrating oil and powdered molybdenum disulfide into the bearings and revolving the wheels at high speed. A small hand grinder with a piece of old air hose slipped over the mounted abrasive point will supply the motive power.

Press the hose against a pallet wheel and spin it. The penetrating oil loosens corrosive elements and dirt, and the spinning throws them out. When the penetrating oil evaporates, a thin, lubricating film of molybdenum disulfide remains. Do not use regular oil; it leaves a dust-collecting film on the bearings.



ANNOUNCING...
Three new refractory
ADM·FEDERAL WASHES





These three new ADM-FEDERAL washes have been perfected in our research laboratories to provide positive solutions to your most persistent casting surface problems.

Properly applied, these washes will help eliminate costly burn-in and produce consistently finer, smoother-finish castings with far less cleaning.

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FOR SHELL, CO_2, AIR-SET, OR OIL-BONDED SYSTEMS

FOR BRUSHING, DIPPING, SWABBING, AND SPRAYING

973 is a water-soluble white powdered pure zircon wash with a working range of 50 to 80° Baume. This is a refractory type wash that resists highest temperatures, thus offering positive protection against metal penetration and burn-in. Except in extreme cases, it is not necessary to use No. 973 zircon wash in its pure state. This wash is completely compatible with No. 974 ceramic wash, and the two may be used in any combination to achieve the desired degree of surface protection. No. 973 zircon wash has excellent suspension properties. Any drying method may be used without developing cracks or blisters.

974 ceramic wash is a white, water soluble refractory-based material in powdered form, having a working range of 28 to 50° Baume. It offers excellent suspension characteristics throughout this wide operating range, and can be torched or oven dried. No. 974 can be blended in combination with No. 973 zircon wash to provide the desired protection at lower cost.

995 SIL-PLAST is a blended plastic refractory-based wash for cores and molds in all types of foundries. Because this material is soluble in either alcohol or water, it is ideal for LINOIL, LIN-O-SET, ADCOSIL, or ADMIREZ cores and molds. In addition, No. 995 SIL-PLAST offers the same wide working range, suspension, and drying characteristics as No. 974 ceramic wash. For ease of handling and elimination of waste, it is packed in 125-lb. polyethylene-lined cartons.

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Archer-Daniels-Midland Company
Federal Foundry Supply Division
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More information, please, on ADM-FEDERAL Wash:

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Foundry Developments

By EDWIN BREMER
Metallurgical Editor

Analytical Procedure

EMISSION spectrometric method used regularly for analyzing various rare-earth oxide mixtures at the Bureau of Mines Rare and Precious Metals Experiment Station, Reno, Nev., is described in Report of Investigations 5454, "Spectrographic Analysis of Rare Earth Elements."

The method has been used successfully for analyzing complex rare earth concentrates, determining impurities in high purity rare earth oxides, and detecting rare earth elements in other materials. The report describes apparatus, analytical procedure, and discusses accuracy of results. It may be obtained from the Publications - Distribution Section, Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13.

Puts on Hot Squeeze

TO FACILITATE studies of materials under a combination of high pressure and temperature, the latest of four high-pressure, high-temperature cells developed at Battelle Memorial Institute, Columbus, Ohio, has just been completed.

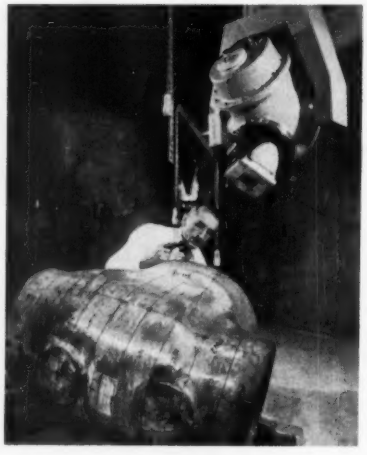
The newest cell will be able to handle specimens up to $\frac{1}{4}$ cubic inch in size. The other three, developed over a period of two years, have produced reactions at temperatures in excess of 5000° F and at pressures of over 1 million psi. The cells have been designed to function at much greater pressures at lower temperatures; operating at room temperature they have provided pressure in excess of 2 million psi.

Determines Fluoride

INDIRECT flame technique using a flame spectrophotometer which simplifies measurement of fluoride concentration in acid solutions is described in Application Data Sheet DK 92-C available from Beckman Scientific & Process Instruments, Fullerton, Calif. Method developed by a large aircraft firm has been found well suited for routine determination of fluoride concentration in solutions used for cleaning steel, aluminum and titanium.

Examines Heavy Sections

REPORTEDLY the highest capacity radioisotope unit ever installed in this country has been placed in operation by Cooper Alloy Corp., Hillside, N. J., for radiographing heavy castings, according to H. A. Cooper, president. The unit shown in the accompanying illustration was manufactured by the Picker X-Ray Corp., White Plains, N. Y., a subsidiary of C.I.T. Financial



Corp. It resembles a one-eyed diving helmet, is termed the Picker Cyclops, and is capable of handling a 1500-curie cobalt 60 source of gamma radiation. The unit will radiograph cast steel sections up to 12 in., and is housed in a specially constructed blockhouse with concrete walls 4 ft thick.

Widens the Coverage

AFTER July 1 the National Bureau of Standards will begin publishing its *Journal of Research* in four separate sections corresponding to subject matter fields. Section A: Physics and Chemistry, issued six times a year, price $4. Section B: Mathematics and Mathematical Physics, issued quarterly, price $2.25. Section C: Engineering and Instrumentation, issued quarterly, price $2.25, and Section D: Radio Propagation, issued six times a year, price $4.

Flexible Graphite

MANUFACTURED graphite now is being produced in flexible fiber and fabric form, according to National Carbon Co. Div., Union Carbide Corp. In a complex process any textile woven or knit form is graphitized by heating it electrically to around 5400° F. The graphite textiles are reported resistant to attack by acids, alkalies and organic compounds except those of a highly oxidizing nature, and are unreactive with many molten metals. Properties include excellent electrical and thermal conductivity, immunity to thermal shock and lubricating properties.

Improves the Flow

DURING studies of the fluidity of aluminum alloys, Flemings, Conrad and Taylor, Massachusetts Institute of Technology, found that coatings applied to the green sand mold face increased the running or flow characteristics remarkably. As reported in "A Fluidity Test for Aluminum Alloys; Tripling Fluidity with a New Mold Coating" at the recent AFS annual meeting, coatings about 0.003 in. thick of amorphous carbon applied by smoking with an oxyacetylene torch, zinc carbonate, calcium carbonate, and hexachlorethane provided appreciable improvement. The greatest effect was obtained with hexachlorethane.

The material also was used in pouring thin plate castings, $\frac{1}{8}$ x 10 x 12 in., and was found to function as effectively as in the case of fluidity spirals. Increasing the coating thickness to 0.006 in. resulted in still further improvement in flow characteristics of the aluminum.

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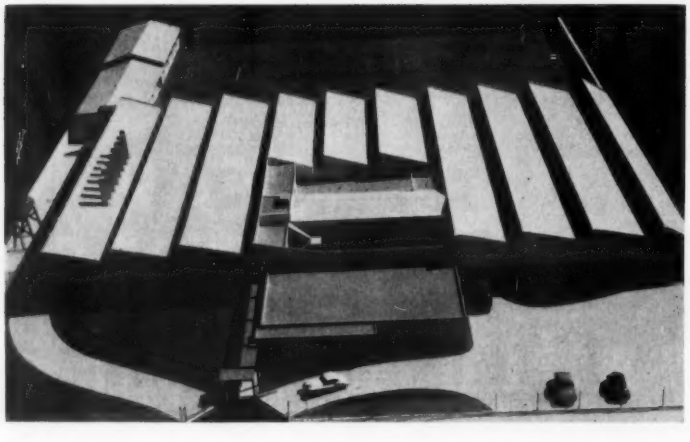
MODERN MEXICAN FOUNDRY

Produces Brass Fittings

By HARRY M. ST. JOHN
Foundry Consultant

Twelve molding stations are equipped with jolt-squeeze machines which use matchplates. Castings produced include brass fittings and valves



Model shows attractive, modern appearance of the Nibco de Mexico plant, in Guadalajara. Heart of the establishment is the brass foundry

Six oil-fired tilting crucible furnaces provide over-all melt capacity of 25,000 lb daily. Furnaces are hooded to exhaust gases and zinc fumes

● THE PLANT of Nibco de Mexico, in Guadalajara, Mexico, presents a modern appearance which conforms to up-to-the-moment ideas of what factory buildings should be. This impression deepens as one enters the brass foundry which, in a sense, is the heart of the establishment. Few foundries anywhere can boast of so orderly and spacious an arrangement and such clean and airy working conditions.

Guadalajara, nearly 400 miles northwest of Mexico City, is the capital of the state of Jalisco. It is Mexico's second largest city and probably its most important industrial center. Nibco de Mexico is affiliated with Northern Indiana Brass Co., Elkhart, Ind., now known as Nibco Inc. It produces for Mexican use the line of fittings for which the American firm is well known. It also manufactures brass valves, of which it is said to be by far the largest producer in Mexico.

Although Nibco de Mexico pays top labor wages according to Mexican standards, even these rates are much lower than those paid in the United States. As a consequence, wheelbarrow and shovel sometimes are more economical than costly conveyors and handling equipment. In modernizing its foundry, Nibco de Mexico placed its emphasis on equipment designed for close control of quality rather than on labor-saving machinery. Pyrometric equipment and a complete sand control laboratory are examples of this emphasis. On the other hand, the economical use of labor has not been neglected. The plant layout provides for an orderly flow of materials from storage bins to finished product.

Except for a small amount of yellow brass for some types of faucets, the alloy used is a red brass of the 85-5-5-5 class. This is melt-

interchangeable with all standard JIC cylinders

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Circle 623 on Page 53

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ed in tilting crucible furnaces, each with a capacity of about 880 lb. Six of these oil-fired furnaces give the foundry an over-all melt capacity of about 25,000 lb per one-shift day. The furnaces are hooded to exhaust combustion gases and zinc fumes. Regulators and control valves are installed in a gallery back of the furnaces with a barrier to protect this area from excessive heat. Overhead is the charging platform, also well protected.

Since much of the work is very light in section, metal usually is poured from the furnaces at temperatures above 2300° F. The temperature is measured and adjusted to the requirements of the job to be poured. Ladles have a capacity of about 300 lb each.

Twelve molding stations are equipped with jolt-squeeze machines which use matchplates. Conveniently placed shakeout grates permit the sand to pass through to the sand-conditioning room on the floor below, and gates of castings are transported to the cleaning room in wheelbarrows. Sand from each day's work is conditioned, tested, and allowed to mellow one day before reuse. It then is dumped into an elevator which carries it to a conveyor belt. This in turn delivers it to the molders' chutes.

Castings go to a core knockout, are cut from the gates by punch press knives, then move to the grinding wheels, where gate stubs and fins are removed. For blasting, machine turnings, which have been graded by screening, are employed. The resulting finish is equivalent in color and texture to that obtained by copper-shot blasting. Like the foundry, the machine shop is spacious and well laid out. Castings are machined, tested, and assembled into finished product in surroundings which are both efficient and pleasant.

Nibco de Mexico is somewhat handicapped by its inability to obtain in Mexico much of the equipment and materials it requires. Machines are imported from the United States and, to some extent, from Europe. Molding sand and core sand come from the United States.

Metal is a problem. Satisfactory brass ingot is not easily available

Circle 624 on Page 53

in Mexico, yet by law it cannot be imported. Nibco's solution to this problem is noteworthy.

The raw materials employed are cathode copper; copper wire scrap; virgin zinc, tin, and lead; automobile radiators; and miscellaneous scrap for yellow brass. The scrap is sorted to remove objectionable items, and charges are made up in such a way as to approximate the desired analysis. These are melted in a direct-flame furnace. Composite heats are then made up and remelted. This procedure may sound rather complicated, but the resulting ingot is of fair quality and is produced at less cost than the price of equivalent ingot in the United States.

Although its foundry is outstanding in Mexico and compares very well with better brass foundries in the United States, Nibco de Mexico is by no means satisfied. Present plans call for further mechanization of its sand handling and improvement in the quality of its molding sand. It is expected that the ingotmaking operation can be developed to produce better ingot at lower cost. More modern machinery is scheduled for the machine shop. It is hoped that the quality and finish of castings, already good, can be improved further by these and other projects now in the planning stage.

The American tourist is fascinated by the picturesque beauty and Old World atmosphere of Mexico. To the American engineer, there is added an appreciation of the nation's industrial growth and the higher standard of living which is certain to result.

Work Simplification Films Are Available from IMS

The 1959 edition of the IMS film rental catalog is now available by writing the Industrial Management Society, 330 South Wells St., Chicago 6. More than 70 films describing work simplification and industrial engineering techniquess are listed.

Approximately 10 to 15 minutes in running time, the films picture before and after phases of training methods and work simplification projects in plant and office operations.

To cut costs with conveyors

Ask Standard

Starting at the molding machines, a complete Standard conveyor system, with transfer cars, is used to move flasks and molds to pouring and storage area, with return lines for empty flasks.

Step up core making production with low-cost roller conveyors

Foundries are finding new savings in production with Standard's low-cost gravity conveyors. One user of national repute states these conveyors have "worked out just fine" for making and handling cores, before and through the oven.

Heavy-duty Standard foundry roller conveyors equipped with shielded bearings make possible smooth, efficient handling of molds and flasks.

Standard offers specialized experience of more than 50 years of designing and building foundry and mill conveyors. For any conveyor need, contact STANDARD CONVEYOR COMPANY, General Offices: North St. Paul 9, Minnesota.

Left: simple, low-cost Standard gravity conveyors speed core making and handling, before and through oven. *Right*: roller conveyors carry molds to the pouring floor.

Send for Standard's special catalog — a valuable reference book illustrating and describing various conveyor installations in leading foundries. Ask for Bulletin 68 — address Dept. N-6.

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Circle 625 on Page 53

Man to Man

By RALPH L. LEE, *President*

Lee Hobby Foundry
Birmingham, Mich.

"There are two kinds of knowledge—one that is used to answer questions and another which we employ in the application of our skills"

The Difference between Knowing and Doing

● I IMAGINE that many other foundries are, like the Lee Hobby Foundry, forced through lack of room to go through the pattern storage to get rid of old back numbers which have been cluttering up the place since Hector was a pup. Last week this rather dismal chore was forced on me. I'll admit that procrastination had much to do with my putting off the much-needed job, but sentiment also was partly responsible. I just couldn't bear the thought of cremating some of those early patterns on which I had spent so many hours of thought and sweat.

Pulling out one old resident that hadn't seen the light of day for some 20 years and laying it beside one of my latest masterpieces, I got a king-sized jolt. It was a mess, I could hardly believe that I was the guy who had whittled out this specimen under the guise of patternmaking. In fact, I was tempted to burn it up before some one walked in on me.

But the farther I got into my museum the more encouraged I felt, for each succeeding specimen showed progress not only in patternmaking, but in the molding, melting, finish, and scrap reduction developments they reminded me of. For a moment I toyed with the thought of how my present masterpieces would compare with those of ten or more years from now. This thought led to a rather challenging question: If I were called on today to take a written examination on patternmaking and foundry practice and lay it down beside one I had taken 29 years or so ago, would there be a tremendous difference? To put it another way, would there be as much difference in the number of things I knew about the foundry then and the things I know today as there undoubtedly is between that old pattern with its resulting casting and one of my latest combinations?

I concluded that there could be no question which would win thumbs down in this odd contest; the patterns and the castings would show the greatest difference by all odds. The skill factor, which never could be expressed in words or written down in examination form, would in my humble opinion spell the great difference between knowing how and the ability to perform.

Like piano playing, patternmaking and molding demand a lot of practice

The more we know about a subject the better off we should be, provided that we put into practice what we have learned. Quiz contest winners are not always distinguished when it comes to applying their volumes of miscellaneous information. I can't help think that there are two kinds of knowledge—one that is used to answer questions and another which we can't put into words but use unconsciously in the application of our skills. One is a product of memory and the other of practice, more practice, and still more practice. Practice takes time, regardless of brilliance or understanding.

Although piano playing is a far cry from making patterns and castings, I don't know of any better illustration of the difference between knowing and doing. With some coaching, almost any normally bright child can explain a piece of music, how time is indicated, the notes, sharps and flats, softness and loudness, the keys, and most of the true essentials. But playing with any degree of skill is another breed of cats. I started studying the piano at the age of 12 and now, at 67, I'm still taking lessons and practicing. I'd have one heck of a time ex-

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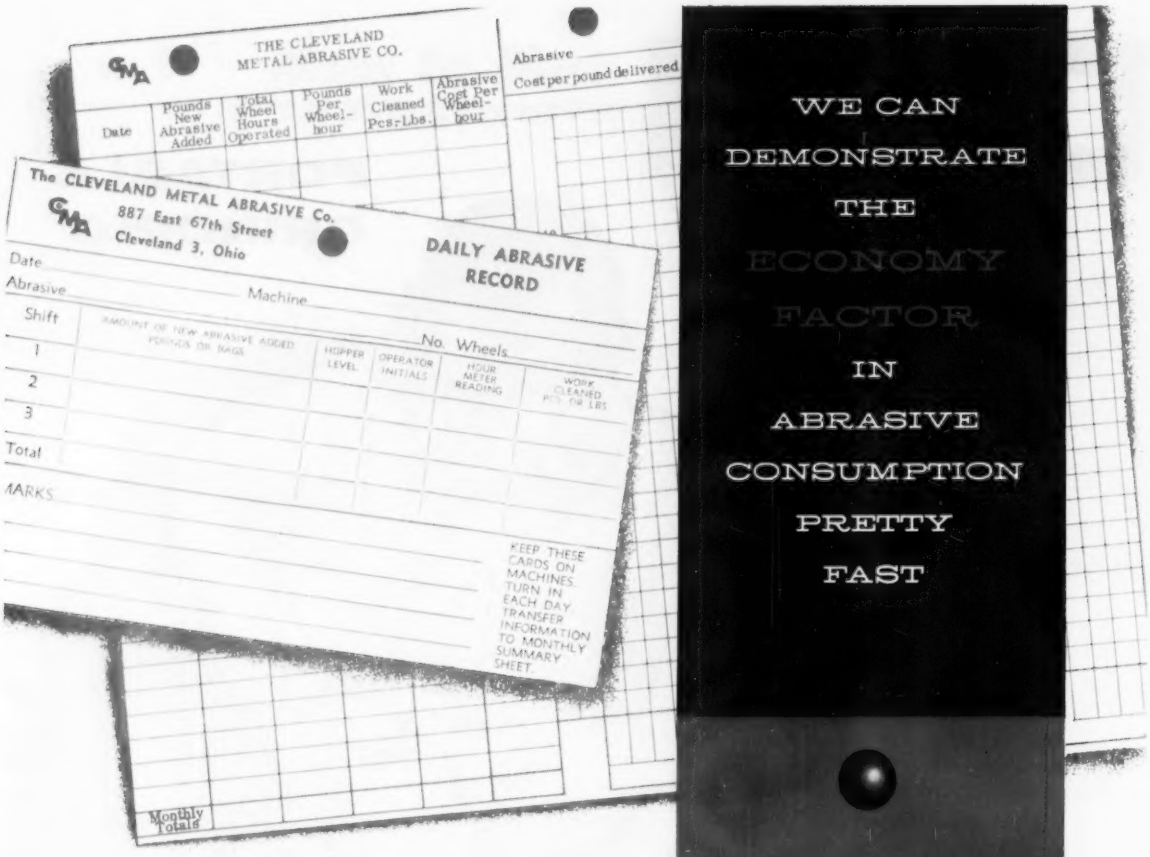
Circle 626 on Page 53



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Circle 627 on Page 53

plaining my progress, but come up and see me some time—I'll play for you.

All of this is to one end. Practice takes time, and knowledge has to be put into practice before it's worth its salt. I'm afraid that with the tremendous emphasis now being placed on education through the memory route, we are neglecting the other kind of education, the kind you can't answer questions with, but the kind that takes thorough practice to produce results—the kind of education that produces unconscious knowledge which automatically comes into play, guiding our fingers and minds in the face of problems and in the doing of skillful work.

It's always a problem for an honor student to face a stretch of apprenticeship in the foundry, particularly when he does not know there is no other way to get the essential, unconscious knowledge that can come only with time and practice. It's a problem for the unusually ambitious career fellow to face the time it takes to build up his practice capital. So if we've done a job of establishing the fact that there are two kinds of knowledge, the conscious memory knowledge and the unconscious practice knowledge, for which time is the indispensable factor, I think we'll have helped a lot of impatient people on to greater and bigger things.

Chicago Chapter, AFS, Picks New Officers and Directors

New president of the Chicago Chapter, AFS, is John C. Mulholland, superintendent of foundry, Pettibone Mulliken Corp. Donald E. Meves, metallurgist, American Steel Foundries, has been named vice president, and W. S. Duncan, sales, Pickands, Mather & Co., secretary.

Elected directors are Gordon Paul, manager of foundry division, Hansell-Elcock Co.; Roy W. Schroeder, associate professor, foundry and pattern laboratory, Navy Pier Branch, University of Illinois; Joseph Semens, metallurgist, South Works, United States Steel Corp.; R. C. Johnston, resident manager, Hickman, Williams & Co.; and Don G. Schmidt, metallurgical engineer, H. Kramer & Co., retiring president.

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Most foundries find that smaller "PAYLOADER" tractor-shovels best meet their needs. But in this one a big 4-wheel-drive model is just right. "I couldn't have bought equipment better fitted to the job if I had paid twice as much," says Don LaTulip, the owner.

Four times a day it works indoors scooping up the hot sand, gagger rods and scrap from the pouring floor and dumping it on grizzly bars. Outdoors it picks up and loads out the cupola drops and waste, including 1½ ton slag skulls, also levels the waste dump and does crane and carrying work.

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Literature for Foundrymen

For More Information Use Reply Card—Page 53

Cold Setting Binder

"Kold-Set Application Studies" is the name of a new four-page publication based on use of the company's cold setting binder for cores and other foundry applications. The first issue has been published, and new ones will appear at regular intervals. —G. E. Smith Inc., 246 Washington Rd., Pittsburgh 16, Pa.

For More Details Circle No. 411—Page 53

Beryllium-Copper Alloys

Folder deals with hot hardness properties of four beryllium-copper alloys. Rockwell hardness tests show relative abilities of the four alloys to maintain mechanical properties at elevated operating temperatures.—Brush Beryllium Co., 4301 Perkins Ave., Cleveland 3, Ohio.

For More Details Circle No. 412—Page 53

Infrared Heat Treating

Technical Bulletin 209, covering a luminous wall combustion system for gas-fired, infrared heat treating furnaces, tells what the system is, how it works, and describes applications.—A. F. Holden Co., 14341 Schaefer Highway, Detroit 27, Mich.

For More Details Circle No. 413—Page 53

Foundry Facings

Foundry facings catalog describes binders, washes, core and mold coatings, core paste, mudding compounds, partings, facings, sand conditioner, solvents, and other products.—Frederic B. Stevens Inc., 1800 18th St., Detroit 16, Mich.

For More Details Circle No. 414—Page 53

Radioactivity Protection

Booklet covers a film badge service, types of badges, and evaluation and control methods for effective monitoring of personnel exposed to x-rays and radioactivity.—R. S. Landauer Jr. & Co., 3920 216th St., Matteson, Ill.

For More Details Circle No. 415—Page 53

Patterns, Molds, and Dies

Folder 591M describes precision-cast patterns and coreboxes for green or resin-bonded sand, permanent molds, dies, and cores.—Wisconsin Pattern Works Inc., 1338 18th St., Racine, Wis.

For More Details Circle No. 416—Page 53

Heat Treating Furnaces

Electric and fuel fired heat treating furnaces and protective atmosphere generators are described in Bulletin 653A.—Hevi-Duty Electric Co., Milwaukee 1, Wis.

For More Details Circle No. 417—Page 53

Sand Mills

Bulletins 143/A and 144/A describe the company's continuous and batch type sand mills. Continuous mills are available in three sizes, the largest having a maximum rated output of 30 tons per hour. Three models of batch mills have capacity ranging from 1 to 4 tons output per hour.—F. E. (North America) Ltd., 47 Advance Rd., Toronto 18, Ont., Canada.

For More Details Circle No. 418—Page 53

Shell Molding Resin

Tentative Technical Brochure F-3-Ra discusses characteristics and uses of a powdered phenol-formaldehyde synthetic resin for making shell molds for the casting of malleable and nodular iron.—Reichhold Chemicals Inc., RCI Bldg., White Plains, N. Y.

For More Details Circle No. 419—Page 53

Dust Collector Cleaner

Bulletin describes a nontoxic cleaner designed to clean wet-type dust collectors in minimum time and keep them operating at peak efficiency.—North American Mogul Products Co., Standard Bldg., Cleveland 13, Ohio.

For More Details Circle No. 420—Page 53

Molten Metal Handling

Form A-1-59 describes company engineering services and fabrication facilities for equipment such as hot metal cars, open hearth ladles, electric furnace ladles, and other equipment.—William B. Pollock Co., Youngstown, Ohio.

For More Details Circle No. 421—Page 53

Pig Iron

Data are given on grades of pig iron produced by the company. Also production facilities and field, laboratory, and mill metallurgical services are discussed in Book ADV.911.—Republic Steel Corp., Advertising Div., 1441 Republic Bldg., Cleveland 1, Ohio.

For More Details Circle No. 422—Page 53

Screw Conveyor Drive

Compact screw conveyor drive consists of a speed reducer, packing gland, and drive shaft which mount as a unit on the trough end. Dimensions, prices, and selection tables are included.—Dodge Mfg. Corp., Mishawaka, Ind.

For More Details Circle No. 423—Page 53

Millivoltmeters

Operating principles, specifications, features and ordering information on control and noncontrol millivoltmeters.—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Philadelphia 44, Pa.

For More Details Circle No. 424—Page 53

Dielectric Sand Core Oven

The principle of operation, features, and specifications for the company's dielectric sand core oven are given in bulletin. Binders to be used, and typical sand mixes are covered.—Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

For More Details Circle No. 425—Page 53

Nondestructive Testing

Fluorescent pentrant testing methods are described in Booklet 1669-1. Booklet 151-1 covers magnetic particle inspection techniques.—Magnaflux Corp., 7300 W. Lawrence Ave., Chicago 31, Ill.

For More Details Circle No. 426—Page 53

Grinding Wheels

Wheels with vitrified, resinoid, and rubber bonds in cut-off, straight, recessed, and plate-mounted styles are described in Bulletin 7525.—Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago 7, Ill.

For More Details Circle No. 427—Page 53

Electrical Connectors

Bulletin 2711 describes a line of plugs and receptacles in environment-resistant construction. — Crouse-Hinds Co., Syracuse 1, N. Y.

For More Details Circle No. 428—Page 53

Fire Extinguishers

"A Guide To Fire Extinguishers" contains tables comparing characteristics of various types of fire extinguishers and the

Did You Miss These?

Here is a list of popular literature items offered in recent months:

COOLING FOUNDRY SAND—Beardsley & Piper, Chicago 39. Circle 401, Page 53.

EPOXY RESIN—Houghton Laboratories Inc., Olean, N. Y. Circle 402, Page 53.

CRUCIBLES—Norton Co., Worcester 6, Mass. Circle 403, Page 53.

CO_2 PROCESS—E. I. du Pont de Nemours & Co., Wilmington 98, Del. Circle 404, Page 53.

CASTING ALLOYS—WaiMet Alloys Co., Detroit 7. Circle 405, Page 53.

OLIVINE SAND—Northwest Olivine Co., Seattle. Circle 406, Page 53.

PERMANENT MOLDS — Meehanite Metal Corp., New Rochelle, N. Y. Circle 407, Page 53.

RADIOGRAPHY — Curtiss-Wright Corp., Princeton, N. J. Circle 408, Page 53.

SHELL MOLD PARTING AGENTS—Dow Corning Corp., Midland, Mich. Circle 409, Page 53.

REFRACTORIES — Carborundum Corp., Perth Amboy, N. J. Circle 410, Page 53.

Makes a Good Impression with Sand

Smith L-O Core Oil

Compatible as Smith L-O is with sand, we recognize that there are always certain conditions that require specialized attention. We suggest, therefore, that you call in a Smith Foundry Service Man — a person of broad, "shirt-sleeve" experience — who will study your conditions and come up with a sound recommendation on the grade of Smith L-O you should use. Take advantage of this valuable assistance, for his help is further proof that Smith L-O *stands also for a service as well as a product.*

Smith L-O Core Oil
ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
INDUSTRIAL OILS DIVISION • ROCKFORD, ILLINOIS

SMITH REPRESENTATIVES

- ALGONQUIN CHEMICAL CO., INC. Hamburg, Pennsylvania
- FOUNDRIES MATERIALS CO. Coldwater, Michigan
- FOUNDRY SERVICE CO. Birmingham, Alabama
- F. F. SHORTSLEEVE Elmira, New York
- ATLAS FOUNDRY SUPPLY CO. Santa Ana, California
- ST. LOUIS COKE & FOUNDRY SUPPLY CO. St. Louis, Missouri
- BRUCE-CONREAUX CO. INC. Indianapolis 7, Indiana
- WESTERN INDUSTRIAL SUPPLY CO. Portland 14, Oregon
- MALCOLM G. STEVENS Arlington, Massachusetts
- OVERSEAS COMMODITIES, LTD. Vancouver, B.C., Canada

Circle 629 on Page 53

effectiveness of extinguishing agents. Cutaway drawings show dry chemical and stored pressure water extinguishers.—**Fire Equipment Div., Ansul Chemical Co.**, Marinette, Wis.

For More Details Circle No. 429—Page 53

V-Belt Fasteners

The use of end fasteners with open-end V-belting, how to determine belt lengths, open-end V-belt replacement charts for endless V-belts, and the design of new drives are among the subjects covered in Bulletin V-227.—**Flexible Steel Lacing Co.**, 4607 Lexington St., Chicago, Ill.

For More Details Circle No. 430—Page 53

Cupola Melting System

Booklet describes a melting system which includes a water-cooled, hot-blast, neutral-lined cupola; skip charger; stack discharge collector, forehearth, and slag collecting, handling, and storage equipment.—**Compagnie Generale des Conduites d'Eau, Departement Installations Metallurgiques**, 1 quai des Vennes, Liege, Belgium.

For More Details Circle No. 431—Page 53

Welder Controller

Data sheet describes a combination electronic controller, consisting of a sequence weld timer and electronic contactor, which provides control for a pneumatically or hydraulically operated resistance welding machine.—**Square D Co.**, 6000 Rivard St., Detroit 11, Mich.

For More Details Circle No. 432—Page 53

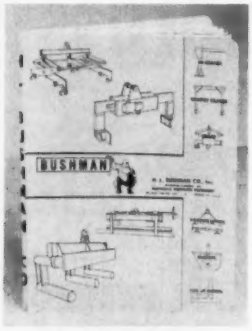
Investment Casting Design

The Investment Casters Society, Los Angeles, has published a booklet portraying the investment casting process, giving cost comparisons with other casting processes, and design recommendations. Copies available from **Picco Industries**, 1729 N. Chico Ave., El Monte, Calif.

For More Details Circle No. 433—Page 53

Material Handling

Loose-leaf catalog presents a complete line of jib cranes, gantry cranes, grabs, buckets, and coil up-enders. Loose-leaf



design permits insertion of current bulletins as they are released.—**H. L. Bushman Co.**, Dept. FD, 100 W. Central Ave., Roselle, Ill.

For More Details Circle No. 434—Page 53

Crane Controls

Electrical and electronic control equipment designed and built for overhead cranes is described and illustrated in Bulletin C5-2. A device for weighing and recording loads on a crane hook also is described.—**Harnischfeger Corp.**, Milwaukee 46, Wis.

For More Details Circle No. 435—Page 53

Self-curing Binder

Folder describes a liquid sand core binder which partially cures in the corebox and requires limited baking for full curing. Mixing procedures and coremaking techniques are outlined.—**Thiem Products Inc.**, Milwaukee 19, Wis.

For More Details Circle No. 436—Page 53

Vanadium Alloys

Leaflet details compositions and applications of ferrovanadium alloys. It describes commercial grade of vanadium metal for alloying ferrous and nonferrous metals.—**Vanadium Corp. of America**, 420 Lexington Ave., New York 17, N. Y.

For More Details Circle No. 437—Page 53

Granite Gaging Products

Brochure 5913 discusses granite surface plates and contains a selector chart listing sizes, ledges, and accuracies of black granite surface plates. Plate stands, gaging accessories, straightedges, parallels,

WITCO STAYRITE® #26

the new lubricant and

release agent for shell

molds and cores

Improve coatings, reduce batch time, cut power consumption, SLASH COSTS with Witco's new Stayrite #26. No-clogging, no-lumping Stayrite #26 promotes free-flowing resin-coated sand. Eliminates reagglomeration tendencies, produces uniform non-segregating coatings.

As internal release agent, eliminates sticking, risk of shell damage in pattern stripping. Ideal for both automatic air-blowing and dump-box methods. Strongly suggest write for details today.

WITCO CHEMICAL COMPANY

122 East 42nd Street, New York 17, New York
Chicago • Akron • Boston • Atlanta • Houston • Los Angeles
San Francisco • Toronto, Canada • London and Manchester, England

magnet chuck platforms, master flats, and deburring stones also are described.—**DoAll Co.**, 254 N. Laurel Ave., Des Plaines, Ill.

For More Details Circle No. 438—Page 53

Air Processing and Heating

Bulletin 518 covering the company's line of products describes equipment for air filtration, process dust control, air conditioning, heating, ventilating, heating specialties, and control for industry.—**American Air Filter Co.**, Dept. PD, 215 Central Ave., Louisville 8, Ky.

For More Details Circle No. 439—Page 53

Lubricants

Bulletin 121 evaluates company lubricants on the basis of temperature, environment, method of application, incorporation into common materials, and recommendations for various parts, operations, and conditions. — **Alpha-Molykote Corp.**, 65 Harvard Ave., Stamford, Conn.

For More Details Circle No. 440—Page 53

Electric Hoists

Low-headroom, electric hoists in capacities from ½ to 10 tons are covered in Bulletin 920. Construction details, mounting option information, performance data, and dimensions are included.—**Robbins & Myers Inc., Hoist & Crane Div.**, Springfield, Ohio.

For More Details Circle No. 441—Page 53

Screens and Shakeouts

Book 2777 describes vibrating screens and foundry shakeouts of 12 different types in 212 sizes. Tables of materials, selection data, drawings, and cut-away photo-

graphs showing construction features are included. Accessory items also are covered.—**Link-Belt Co.**, Dept. PR, Prudential Plaza, Chicago 1, Ill.

For More Details Circle No. 442—Page 53

Cupola Hot Blast

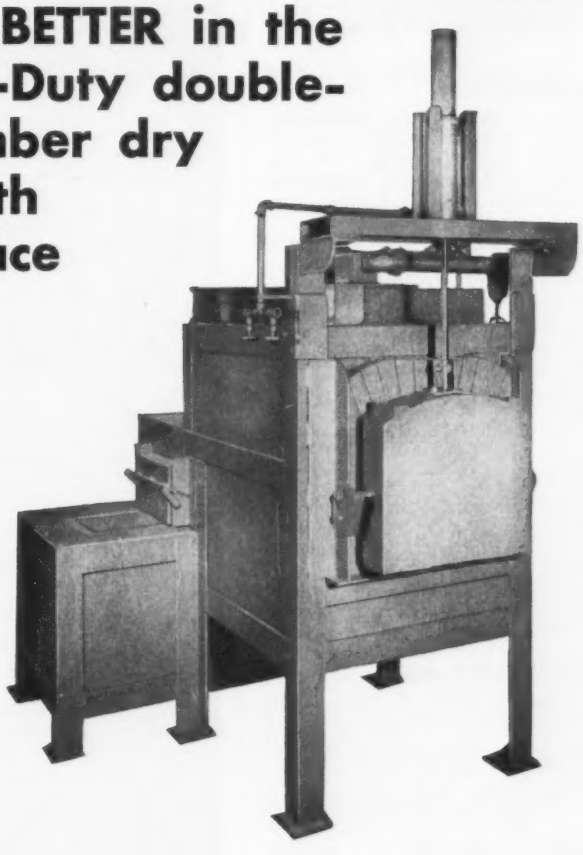
A reprinted article from the *Gray Iron News* describes advantages achieved through use of a hot blast system on the cupola of W. O. Larsen Foundry Co.—**Brown Thermal Products Corp.**, 403 Huron St., Elyria, Ohio.

For More Details Circle No. 443—Page 53

V-belt Drives

Design information on multiple v-belt drives, including tables of data on sheave diameters and belt lengths and on how to determine service life of the drive being

Aluminum is melted FASTER and BETTER in the Hevi-Duty double-chamber dry hearth furnace



Separate Chambers Improve Uniformity, Increase Speed

Metal is melted on a sloping hearth and runs off into a separate holding chamber. Here it is held at a constant pouring temperature by thermocouple control. There is no danger of overheating and no cold metal enters the bath. This double-chamber design provides the best continuous production-line method for melting high-quality metals.

Direct Firing Boosts Quality and Efficiency

Moisture evaporates and is carried off during melting. All oxides are deposited on hearth surface, none are carried into the bath. Lack of need for bath agitation eliminates gas inclusions. Direct firing also saves fuel costs and provides more comfortable working temperatures around the furnace.

Write for Bulletin C-80 for complete details.

- **Industrial Furnaces Electric or Fuel**
- **Dry Type Transformers**
- **Constant Current Regulators**

HEVI DUTY ELECTRIC CO.
Milwaukee 1, Wisconsin

Circle 631 on Page 53

designed, is presented in Catalog DH-900. —Gates Rubber Co., 999 S. Broadway, Denver 17, Colo.

For More Details Circle No. 444—Page 53

Smelting-Refining

A simple technique for electric furnace smelting and subsequent refining of almost any type of iron ore is described in brochure.—Koppers Co., Engineering & Construction Div., 1124 Koppers Bldg., Pittsburgh 19, Pa.

For More Details Circle No. 445—Page 53

Tools, Fixtures, Prototypes

Brochure describes company facilities for producing tools, gages, fixtures, prototypes, complicated parts, components, or assemblies.—C. M. Smillie & Co., 1100 Woodward Heights Blvd., Detroit 20, Mich.

For More Details Circle No. 446—Page 53

Fans

A series of radial blade fans rated at 60,000 cfm and higher, at pressures up to 18 in. sp, and for service at temperatures to 1850° F is described in Bulletin RF 589-H.—Garden City Fan Co., 801 N. Eighth St., Niles, Mich.

For More Details Circle No. 447—Page 53

Punched Card System

A low-cost system of punched-card data processing designed for small business is described in Folder U1638.—Remington Rand Univac Div., Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y.

For More Details Circle No. 448—Page 53

Vibrating Conveyors

Catalog gives information on material handling operations, flow charts, application illustrations, capacities, dimensions, and other selection data.—Ajax Flexible Coupling Co., Westfield, N. Y.

For More Details Circle No. 449—Page 53

Dust and Fume Control

Individually engineered air contaminant control systems are discussed in catalog. Wet, dry, electrical, and centrifugal collection units are shown.—Kirk & Blum Mfg. Co., Cincinnati 9, Ohio.

For More Details Circle No. 450—Page 53

Electric Motor Starters

Data covering design, dimensions, ratings, and prices on manual starters for electric motors are given in Bulletin 11B1. —Furnas Electric Co., 1151 McKee St., Batavia, Ill.

For More Details Circle No. 451—Page 53

Grinding Wheel Dressers

Illustrated data folder is a guide to the proper selection and application of grinding wheel dressers and cutters.—Machine Products Corp., 125 Hollier St., Dayton 3, Ohio.

For More Details Circle No. 452—Page 53

Aluminum Alloy

"Alloy Data Book" presents characteristics and typical properties at room and elevated temperatures for a high strength natural aging aluminum-zinc-magnesium-

UP TO 360 SHELL MOLDS PER HOUR, bonded with Durez resin, move out from two four-station Link-Belt molding machines. Screened sand for molds flows from storage bins directly into mixer, where it is coated with **Durez 18250** resin. Coated sand goes to a surge bin, then is screw-fed to molding machines.

Take a fast trip through a "push-button" shell-

When foundry-equipment specialists build their *own* shell-molding line, you can expect to see a high order of mechanization.

You're not disappointed when you look in on Link-Belt Company's new Ewart malleable iron foundry in Indianapolis.

Like everything else in this foundry, the shell-bonding resin, *Durez 18250*, has been chosen for its ability to match every requirement of the highly automated process.

The use of powdered resin helps keep sand-coating time to a minimum. Its *fast cure* permits molding machines to work at top capacity. The *high-strength molds* it produces have helped Link-Belt get smooth-surfaced, accurate castings—castings that need very little machining.

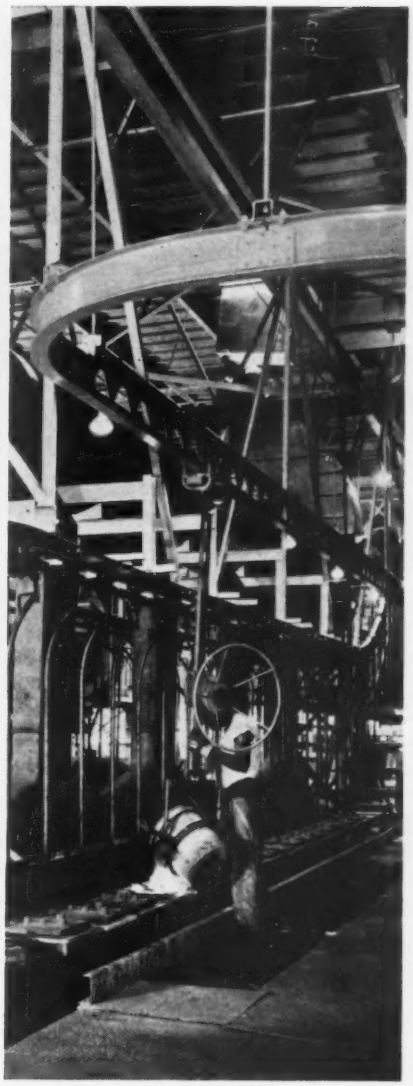
Finally, the mold-to-mold, shift-to-shift *sameness* of this Durez resin gives Link-Belt foundrymen the consistent results that are vital to good productivity.

Where to get help with resin problems

If you too, want to get *all* the benefits of shell molding and coring, have a talk with your Durez sales engineer. He can show you how you get less of *every* shell-molding problem when you work with Durez resins —and more of the accuracy and speed that shell molding gives you.

He's foundry-trained—has assisted many foundrymen with needs like yours. Call him in soon.

MOLDS RIDE A TROLLEY to pouring area. High-speed production requires a high level of uniformity in mold materials. Durez foundry resin meets the exacting specifications.



MEN POUR WHILE ON THE MOVE. Pouring platform travels at same speed as mold conveyor. Three men can pour simultaneously. Strong, uniform molds help keep rejects to a minimum.

COOLED CASTINGS AND SAND spill automatically onto shakeout screen. Castings and sprue are conveyed to sorting and spruing apron. Sand goes by oscillating conveyor and bucket elevator to reclamation and storage.

molding line

New 32-page "Guide to Shell Molding"

Valuable manual contains recommendations on patterns, materials, mixing, temperatures, lubricants, molds, cores. Written by men who have worked with shell molding for years. Yours free—just write for it.

DUREZ PLASTICS DIVISION

1006 WALCK ROAD, NORTH TONAWANDA, N. Y.

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

chromium-titanium alloy designated Frontier 40-E.—**Frontier Bronze Corp.**, 4872 Packard Rd., Niagara Falls, N. Y.

For More Details Circle No. 453—Page 53

Sand Preparation Machinery

The company's line of sand preparation machinery is portrayed and described in Bulletin 1230. Specification tables are included.—**Beardsley & Piper**, a division of **Pettibone Mulliken Corp.**, 2424 N. Cicero Ave., Chicago 39, Ill.

For More Details Circle No. 454—Page 53

Fork Trucks

Condensed catalog contains engineering data, specifications, and operating information on basic fork truck models and attachments. — **Elwell-Parker Electric Co.**, 4205 St. Clair Ave., Cleveland 3, Ohio.

For More Details Circle No. 455—Page 53

Conveyor Belt Carriers

Photographs, drawings, descriptive data, and specifications covering the company's line of conveyor belt carriers are presented in Bulletin 355.—**Stephens-Adamson Mfg. Co.**, Aurora, Ill.

For More Details Circle No. 456—Page 53

Air Filter

Performance, construction, and installation details of a dry space filter are described in Brochure 1505-6.—**Mine Safety Appliances Co.**, 201 N. Braddock Ave., Pittsburgh 8, Pa.

For More Details Circle No. 457—Page 53

Lever-operated Hoists

Safety chart illustrates safe handling of lever-operated hoists and describes, briefly, the company's hoists of this type.—**Manning, Maxwell & Moore Inc.**, Muskegon, Mich.

For More Details Circle No. 458—Page 53

Spray Binders

Folder describes spray binders for green sand molds in steel, gray iron, malleable, and nonferrous foundries.—**Delta Oil Products Co.**, 6263 Cedarburg Rd., Milwaukee 9, Wis.

For More Details Circle No. 459—Page 53

Battery Chargers

Compact, vertically-mounted motor-generator battery chargers which occupy little floor space are described in Form 6259.—**Exide Industrial Div., Electric Storage Battery Co., Philadelphia 20, Pa.**

For More Details Circle No. 460—Page 53

pH Meter

Compact electrometer testing kit gives direct readings of pH measurements in sand and other materials.—**Coleman Instruments Inc.**, 42 Madison St., Maywood, Ill.

For More Details Circle No. 461—Page 53

Wheel Block

A cast steel wheel block to keep trucks, trailers, and other vehicles from rolling during loading or unloading is described in Bulletin B43.—**Calumet Steel Castings Corp.**, 1636 Summer St., Hammond, Ind.

For More Details Circle No. 462—Page 53

Circle 632 on Page 53

Left to right at the last session of the seminar are Frank Ryan, chairman, and the speakers, Lynn Charlson, Arthur Johnson, Wayne Wright, Merle Weltzin, and Clayton Brace

Part of room full of Twin City engineers, designers, and buyers. The attendance averaged 160 per session

Twin City Foundrymen Sponsor

CASTINGS SEMINAR

By J. DAVID JOHNSON
Anoka, Minn.

● TWIN CITY foundrymen have learned that many present and potential buyers of castings are eager to know how to make better use of cast metal products.

More than 300 persons attended a four-session Engineered Castings Seminar sponsored by the Twin City Chapter, American Foundrymen's Society, and the University of Minnesota. The sessions, held on four Monday evenings during March at the university's Mechanical Engineering Building, had attendances ranging from 139 to 195. The previous seminar, held in 1957, averaged fewer than 80 per session.

Seminar chairman was Frank S. Ryan, St. Paul Brass Foundry, St. Paul. Serving on his committee were John Entenmann, sales engineer, Northern Malleable Iron Co., St. Paul; John Wallfred, research engineer, Minneapolis Electric Steel Castings Co., Minneapolis, and J. David Johnson, J. David Johnson Co., Anoka, Minn.

Theme of the discussions was "Economics of Engineered Castings," with all talks slanted directly to the designer and user of cast products.

The first session treated "Proper Castings Design and Specifications." William Ball Jr., R. Lavin & Sons Inc., Cincinnati, covered the subject from the nonferrous viewpoint, and John B. Caine, foundry consultant, Cincinnati, discussed ferrous castings.

At the second session, Clinton C. Forster, Toro Mfg. Co., talked on "The Castings User Point of View." Donald Moll, Minneapolis Electric Steel Castings Co., gave the castings producers' viewpoints in his remarks.

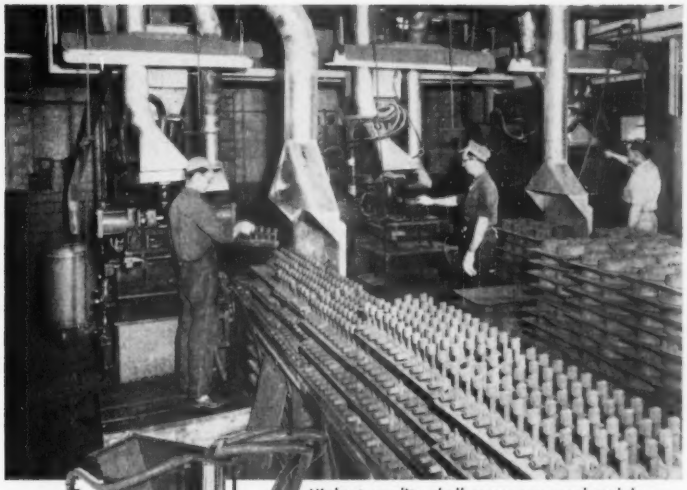
"Castings Economics" was the subject of the third session. It included a roundtable discussion of "Castings vs Other Processes" and "Advantages and Disadvantages of Castings." Speakers were Norman C. Qualey, Northern Ordnance Inc., Minneapolis; K. F. Potter, American Hoist & Derrick Co., St. Paul; Phillip E. Gustafson, Minneapolis Honeywell Regulator Co., Hopkins, Minn., and Donald Fulton, Northern Malleable Iron Co., St. Paul. In addition, the Steel Founders' Society's film, "Photo Elastic Studies of Joined Sections," was shown.

The concluding session had five speakers who discussed various molding and casting processes. Subjects and speakers were the following: Shell and CO_2 cores by Arthur Johnson, Northern Malleable Iron Co.; aluminum permanent mold casting by Merle Weltzin, Permanent Mold Div., Progress Foundries Inc., St. Paul; zinc and aluminum diecastings by Lynn Charlson, Char-Lynn Co., Minneapolis; shell molding by Wayne A. Wright, Woodruff & Edwards Inc., Elgin, Ill.; investment casting by Clayton Brace, Brace Inc., Minneapolis.

from EATON Manufacturing Co.

"Our BLO-CORE machines have opened new fields of application for Permanent-Mold Gray Iron Castings and have made us more competitive due to net cost reductions . . ."

HOWARD U. McCLELLAND, Chief Engineer, Foundry Division

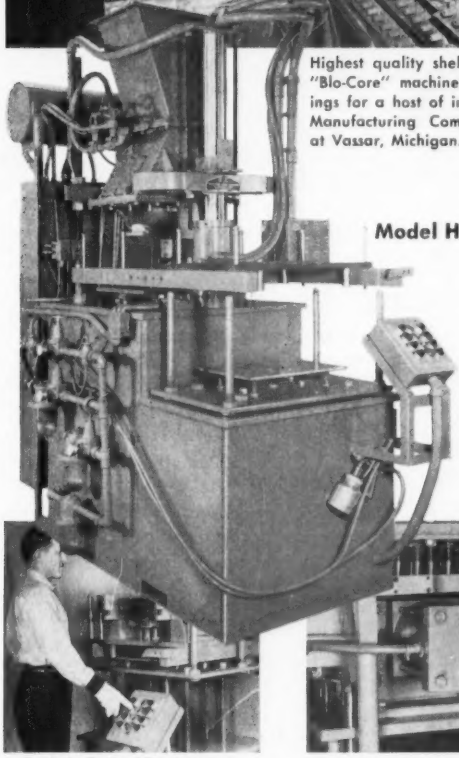


Highest quality shell cores are produced by "Blo-Core" machines to insure uniform castings for a host of industries served by Eaton Manufacturing Company's Foundry Division at Vassar, Michigan.

Millions of permanent-mold gray iron castings are produced annually by the Foundry Division of Eaton Manufacturing Company. These castings come in intricately-cored designs and shapes weighing from a few ounces up to twenty-five pounds. Great uniformity is an absolute necessity.

To meet the challenge of maintaining high quality while keeping costs as low as possible, Eaton turned to the C & S "Blo-Core" automatic shell machine. How well the "Blo-Core" performed this vital assignment can best be summed up in the above quotation of the division's chief engineer, who added: "To date we have made several hundred thousand shell cores on these machines and are very pleased with the results."

Perhaps your operation can profit from the many advantages offered by the fully automatic "Blo-Core." Our experienced engineers will be pleased to help you solve your foundry problems. Write for Bulletin CS-1622.

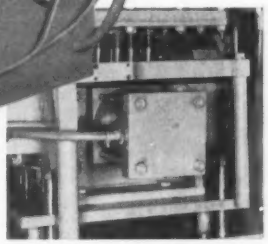


Model HI-1824 **BLO-CORE** *Automatic* **SHELL MACHINE**

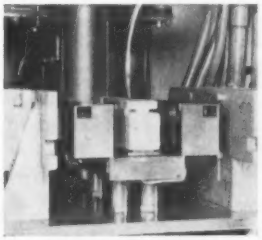
SHELL CORES—SHELL MOLDS EVERY 30 SECONDS

- Core Boxes Up to 15" x 20" x 30" High
- Mold Boxes Up to 20" x 30" x 16" Draw
- Horizontally-parted Mold Boxes
- Vertically Split Core Boxes
- 4-part Draw Split Core Boxes
- Two Station Rotary Operations. NO OVENS.

Push the Button! The box closes and the "Blo-Core" cycle commences . . .



Rotating 180°, box is indexed under blow nozzles. Mix is blown into hot box. Curing starts immediately . . .



Returning to starting position, box is opened, shell is completely cured. Stripping operation completes cycle.

C&S PRODUCTS COMPANY INCORPORATED

Affiliated with Barber-Greene

18656 Fitzpatrick Ave.
Detroit 28, Michigan, U.S.A.

Around the Country

NEWS REPORTS FROM

Chicago . . . Philadelphia . . . Pittsburgh

Philadelphia— Following a slow increase earlier in the year, gray iron and nonferrous casting demand has leveled off, and in the case of steel castings has declined. Malleable business still shows a modest uptrend.

In gray iron, few job shops are operating in excess of four days a week and fewer still are operating on a full schedule with a full working crew. Operations show little change at around 75 per cent of normal. Light and medium work is holding up best, including power transmission machinery components, materials handling equipment, and cigarette making machinery. Auto die work is off, with little likelihood of a pickup before next fall. Miscellaneous construction needs are being sustained in rather good volume.

Steel foundry operations are easier at around 60 to 65 per cent, reflecting a drop in miscellaneous requirements, and no improvement in heavy industrial equipment needs. Shipments on most orders can be had within four weeks, which is good time, considering normal processing.

Most malleable shops are operating five days a week with full working forces. Building and construction hardware, including pipe fittings, is moving well, with the trend seasonally upward. Transmission hardware is in good steady demand.

Inquiry for brass and bronze castings is rather spotty. Average business, however, is at least holding its own, even if not too active. There is some overflow from captive shops which is tending to sustain general volume among the job shops.

Pig iron continues in easy supply, with most foundry consumers showing no disposition to build up stocks, notwithstanding the threat of a steel strike this summer.

Chicago— Aroused by the threat of loss of jobs as the result of plant and foundry closings or curtailments of permanent character, union officials are protesting and taking active steps toward having existing operations continued. Two notable examples of this have made the news here recently.

In March, Crane Co. announced it is quitting the manufacture of malleable and cast iron pipe fittings with closing of foundries and machine shops in two departments.

oh! IT'S SO SMOOTH AND SO LONG LASTING!

the new, all new NYLON NOTAT TIRE!

For a s-m-o-o-t-h ride, specify this improved NOTAT premium tire; softer rubber with Nylon assures easier riding, easier steering, no downtime, more traction and NO FLATS WITH NOTAT.

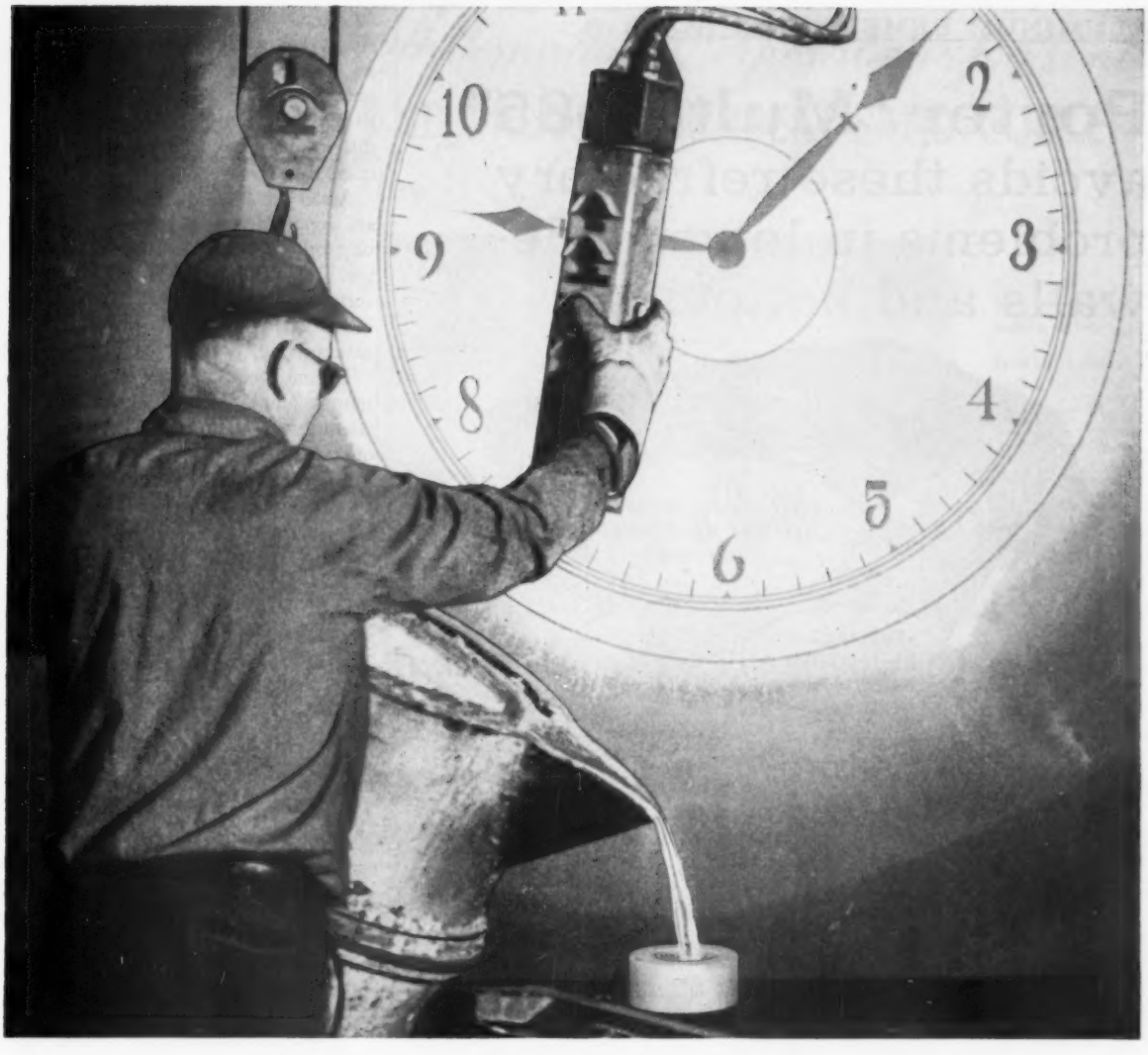
NO TUBE AIR TROUBLE

PATENT PENDING

"WRITE TODAY FOR THIS OUTSTANDING INDUSTRIAL PNEUMATIC TIRE REPLACEMENT."

NOTAT TIRE COMPANY

1504 East 34th St. Chattanooga, Tennessee



With new RIS-A-SLEEVS by Johns-Manville . . .

riser metal stays molten . . . precious minutes longer!

Now—for aluminum, brass and bronze casting—a new riser sleeve that contains heat more effectively than any product of its kind!

Here's the kind of riser sleeve you've long hoped would come along!

Developed by Johns-Manville research scientists, RIS-A-SLEEV® reduces heat transfer as effectively as an advanced industrial insulation. With heat more effectively contained within the sleeve, you have precious minutes longer to feed small remote areas, and greater assurance that the riser metal will be very last to freeze.

Because RIS-A-SLEEV insulates better, it lets you cut down still further on riser sizes . . . gives you closer control of solidification . . . results in sounder castings and fewer rejects.

And, of course, RIS-A-SLEEV will not contaminate sand. It's ideal, too, for blind risers. Available in complete range of sizes . . . at surprisingly little cost. We invite you to test RIS-A-SLEEV. We'll be pleased to send you samples along with complete information. Write today to Johns-Manville, Box 14, New York 16, New York.

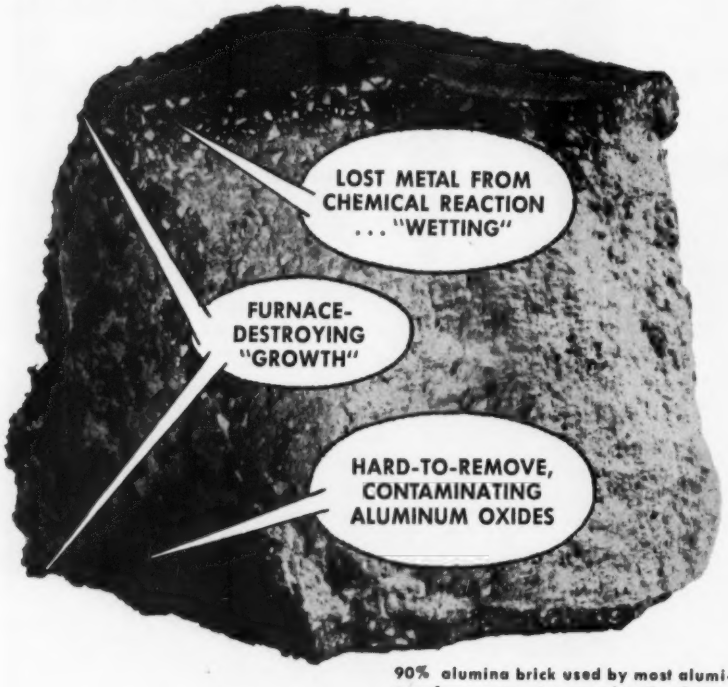
JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

Circle 635 on Page 53

ALUMINUM REMELT FURNACES:

Porter "Multex-85" avoids these refractory problems in lower sidewalls and bottoms . . .



90% alumina brick used by most aluminum furnace operators as a hearth refactory

You've seen the conditions illustrated here, in your own furnaces! These are the typical, costly problems encountered with most refractories for aluminum furnaces! Porter "Multex-85" can virtually eliminate these irritating furnace conditions, *and* give you improved metal quality. "Multex-85" costs less than most aluminum refractories, cuts cleaning costs, results in virtually no metal loss (and is easily and economically removed).

We can show you countless test results that are already a matter of record. But the best comparison is a "Multex-85" lining tried under *your* operating conditions. Installed and operated according to accepted good practices, a "Multex-85" lining will give you better results than your present refractory . . . *a difference you can count in dollars.*

For complete information write: *Mullite Works, Refractories Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

REFRACTORIES PORTER DIVISION

H.K. PORTER COMPANY, INC.

Divisions: Connors Steel, Delta-Star Electric, Disston, Forge & Fittings, Leschen Wire Rope, Mouldings, National Electric, Refractories, Riverside-Alloy Metal, Thermoid, Vulcan-Kidd Steel, H. K. Porter Company (Canada) Ltd.

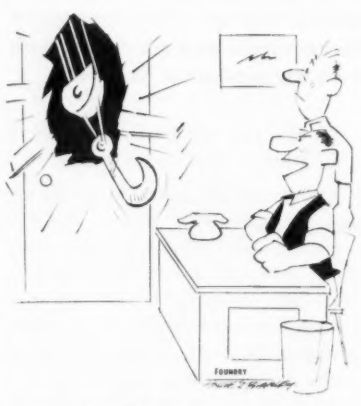
Affected will be about 700 of 5200 employees at the company's plant at 4100 S. Kedzie Ave. While abandoning manufacture of these fittings, the company will merchandise these products made by other companies.

Adverse competitive conditions are reported as the reason for getting out of this manufacturing sector. The company is expected to continue making steel, iron and brass valves, welding and flanged fittings and plumbing brass.

It had been known that Crane management has been reviewing its position in various manufacturing operations to determine if they can be considered profitable. Despite company denials, the announcement of shutdown of the malleable and cast iron fittings division aroused fears that closing of Chicago operations is in the offing. As a result, two locals of the United Steelworkers Union solicited proxies from stockholder employees for David McDonald, international union president, so that he could represent their interests at the annual stockholders meeting April 28.

The boom to seat Mr. McDonald on the board of directors came to a quick end on the morning of the meeting when the Securities and Exchange Commission ruled the proxy solicitation illegal because there had been no filing of proxy material and background information on the participants.

The other example of union activity sprang from an announcement of International Harvester Co. on April 17 that it would gradually discontinue over a three-year period production of farm implements at



"I wish that crane operator would knock like everyone else"

International Automation Corporation presents

THE NEW TRIED AND PROVEN "BUHRER" SAND COOLER

LOW COST OPERATION
Less than 1 cent per ton (for direct operation).

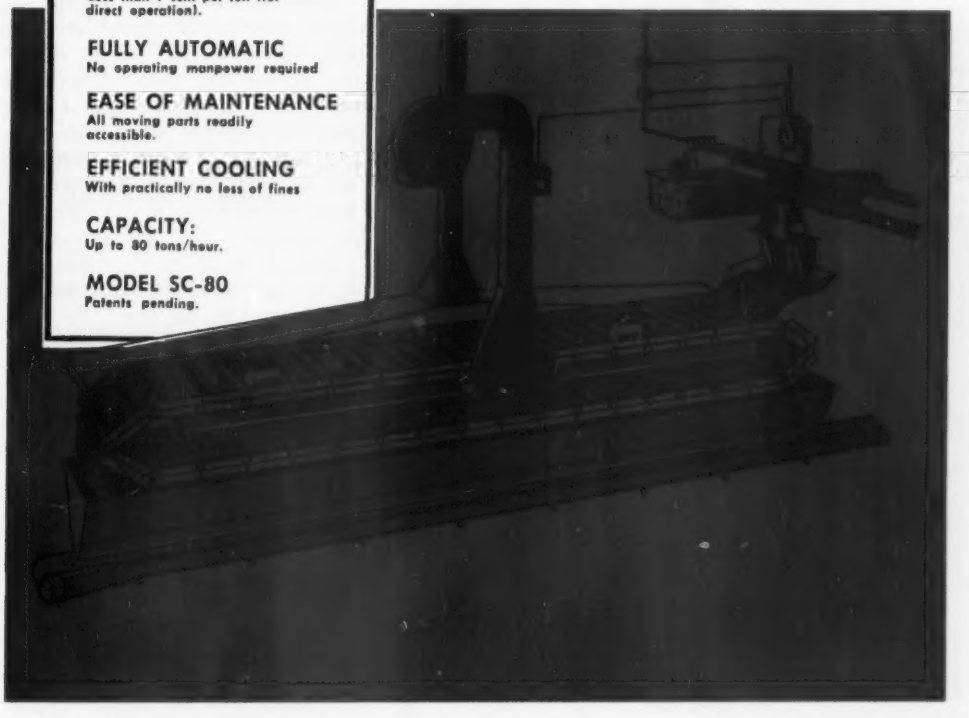
FULLY AUTOMATIC
No operating manpower required

EASE OF MAINTENANCE
All moving parts readily accessible.

EFFICIENT COOLING
With practically no loss of fines

CAPACITY:
Up to 80 tons/hour.

MODEL SC-80
Patents pending.



Save by reducing casting defects.

Save by reducing the use of parting agents.

No loss of "Fines".

No loss of re-usable binder.

Save on binder additions.

Much better control of sand properties at the mill and at the molding stations.

Save on maintenance cost.

Better working conditions.

Perfect control of molding sand properties is an absolute necessity for any successful molding operation.

Strength, permeability, flowability, etc., must be accurately controlled in the mixing unit and, equally important, these properties must be stable to insure uniformity at the molding stations.

Only the use of a cool sand guarantees stability. Variations in sand properties, caused by varying evaporation of the moisture, are eliminated.

The use of hot molding sand not only causes control loss of sand properties at the molding stations, but is also directly responsible for many casting defects.

IAC

INTERNATIONAL AUTOMATION CORP.

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Phone NOrmandy 2-1342

INTERNATIONAL AUTOMATION CORPORATION

Gentlemen: Please send me, without any obligation on my part, a free copy of your bulletin SC-80.

NAME ..... TITLE .....

COMPANY .....

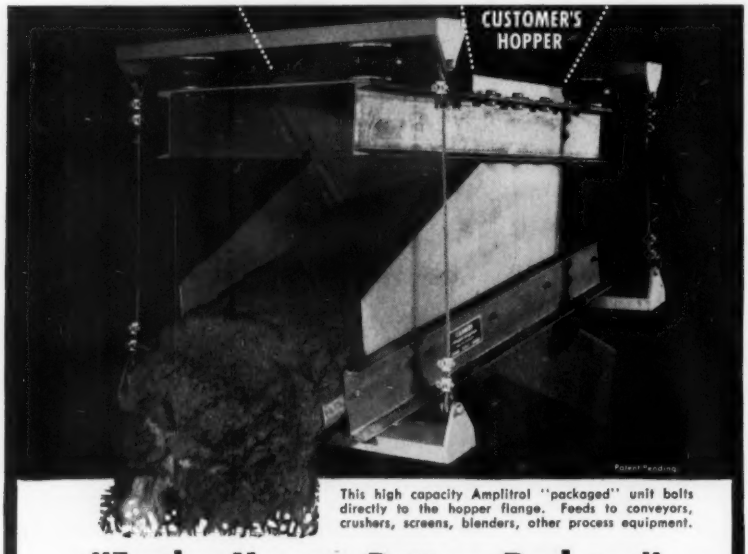
ADDRESS .....

.....

its McCormick Works in Chicago. Its closing will affect some 3800 jobs. The announcement stated that some foundry operations would go on after farm implement production ceases, employing about 500 people. Castings will continue to be made in the nodular iron foundry and some operations will be carried on in the present malleable iron foundry with other production transferred to Waukesha, Wis.

McCormick Works was established in 1847, and for six decades until the 1930's it was the world's largest farm implement plant. The McCormick harvester and some of the early models of the now widely used harvester-threshers were built in the plant.

On April 27 an eight-man delegation from the United Auto Workers met with Chicago Mayor Richard J. Daley to enlist his assistance in a campaign to prevent the closing of the McCormick works. The mayor pledged he would ask International Harvester to reconsider.



This high capacity Amplitrol "packaged" unit bolts directly to the hopper flange. Feeds to conveyors, crushers, screens, blenders, other process equipment.

"Feeder-Hopper Bottom Package" Reduces Design, Installation Costs!

For the first time a feeder is offered as part of a complete pre-engineered feeder-hopper bottom package. When you design with Carrier Amplitrol feeders, you merely design a hopper flange to bolt to the packaged unit. *This saves you both engineering design and installation costs!*

This preassembled packaged unit is built around the revolutionary new Amplitrol feeder — first mechanical vibrating feeder with variable, stepless control—and includes the hopper bottom, flanged hopper connection, skirt plates, regulating gate, isolation and suspension supports.

The feeder-hopper bottom unit is offered in two models—one for *high capacity* applications and one for *maximum control.*

Amplitrol's exclusive long-stroke drive handles higher capacities by automatically compensating for headload. This allows larger hopper openings, reduces bridging and hang-up. The simple, fast-responding pneumatic control system operates manually or in automatic response to any standard process instrumentation.

Send for new Bulletin No. 591 describing Amplitrol "package" in detail. Carrier Conveyor Corporation, 222-A North Jackson Street, Louisville, Kentucky.

CARRIER
-NATURAL-FREQUENCY-
VIBRATING EQUIPMENT
Engineering Specialists in Vibrating Equipment

CONVEY ● FEED
DEWATER ● SCREEN
COOL ● AGGLOMERATE
DRY ● SCALP ● COAT
DISTRIBUTE ● ELEVATE
● FLATTEN BAGS

Pittsburgh— Foundry sales still leave much to be desired, but there's been no slackening in the upward trend. Business activity has improved steadily for the last six months. With district mills operating close to capacity, rolls and ingot molds are in strong demand.

Steel foundries are operating 40 hours a week, and several have sizable backlogs. Those that supply the automotive, steel, agricultural equipment, and plumbing and heating industries are faring best. Miscellaneous and jobbing foundries still are scratching for business and some are operating at less than half of capacity.

Fearing a midyear strike and higher prices, many foundries are stocking up on pig iron. To meet an almost unprecedented demand, one supplier is operating all of its blast furnaces and coke ovens at capacity. "Second quarter sales were the largest in our history," a company official reports.

New and Expanded Edition of *The Grinding Wheel* Offered

Revised edition of *The Grinding Wheel,* published by the Grinding Wheel Institute, now is available. It discusses grinding wheels, grinding machines, and grinding operations from a basic, as well as a practical, standpoint.

The current, revised edition is based on the 1951 edition but expanded to contain over 100 pages of new material. Four new chapters have been added: Mounted Wheels, Reinforced Wheels, Automation and Advanced Mechanization, and Safety. Important changes made in almost every chapter of the book reflect advancements in the grinding art since publication of the original work.

Of particular interest to foundries are sections devoted to rough grinding, fundamentals of grinding, and efficient wheel selection. The text spells out how wheels can be selected for most efficient work, how the grinding process actually removes metal, how to select speeds and feeds and how much material can be removed efficiently.

A detailed, 16-page wheel selection chart gives wheel recommendations for grinding every major kind of material. The subject of safety

has been given a chapter of its own.

Each chapter has been reviewed by experts in each field, and the book is said to be as up-to-date as possible. The revision was directed by W. F. Schleicher under the auspices of the Grinding Wheel Institute.

Copies of the 532-page book are available from the Grinding Wheel Institute, 2130 Keith Bldg., Cleveland 15, Ohio, for $4.95.

Organization Is Completed By Ductile Iron Society

Ductile Iron Society completed its organization at a recent meeting in Chicago of member company representatives at which officers and directors were elected.

Robert S. Thompson

Robert S. Thompson, president, H. P. Deuscher Co., Hamilton, Ohio, who was named the society's first president, stated that the purpose of the organization will be to represent its members in all matters of common interest in the fields of metallurgical research, product development and promotion, technical advice, and operational improvement.

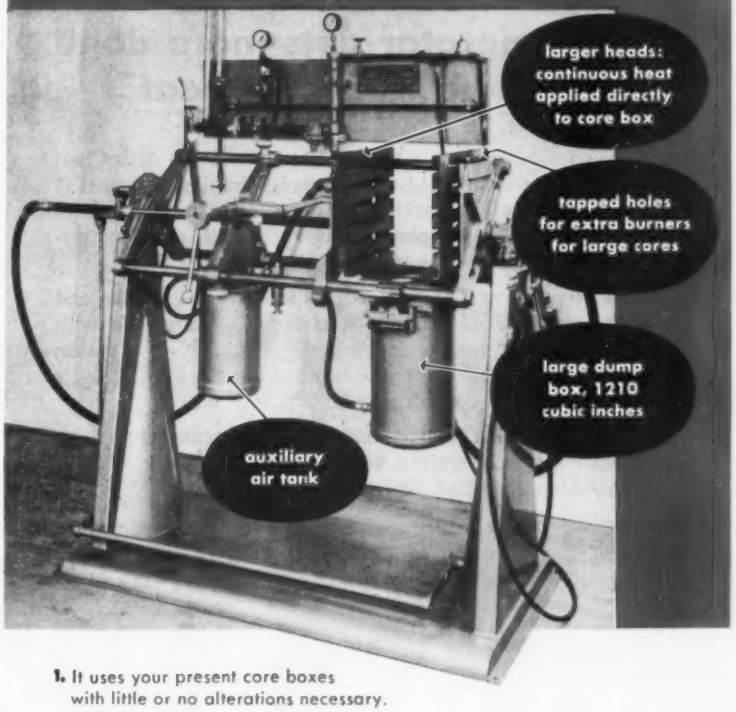
In addition to Mr. Thompson, officers are the following: Vice president, William Beatty, vice president, Morris Bean & Co., Yellow Springs, Ohio; secretary-treasurer, R. K. Guise, metallurgist, Kuhns Brothers Co., Dayton, Ohio; executive secretary, James H. Lansing, castings consultant, Cleveland.

These directors were chosen: Midwest Section—W. H. Shinn, Gunite Foundries Corp., Rockford, Ill., and W. B. Aylward, Neenah Foundry Co., Neenah, Wis. Eastern Section—Arthur Avedisian, Taylor & Fenn Co., Windsor, Conn., and Armande Giorgio, Ductile Iron Foundry Inc., Stratford, Conn. Southern Section—Niel Mingeldorf, Savannah Machine & Foundry Co., Savannah, Ga. Southwest Section— E. C. Graham, Acme Foundry & Machine Co., Blackwell, Okla. West Coast Section— J. R. Ludwig, Soundcast Co., Newport Beach, Calif.

Announcing the New "200 SERIES"

'DEPENDABLE'

SHELL CORE MACHINE


larger heads: continuous heat applied directly to core box
tapped holes for extra burners for large cores
large dump box, 1210 cubic inches
auxiliary air tank

1. It uses your present core boxes with little or no alterations necessary. No need to build new core boxes.
2. Continuous heat applied directly to back of core box. Thin sections most desirable. Fast and efficient.
3. Operates on any type of gas, natural, manufactured, mixed or bottled. Economical.
4. Quick change for short runs. Clamps provided.
5. Produces intricate small cores in four gang boxes at the rate of ten per minute, and cores up to 14" diameters or 30" lengths at the rate of one per minute.
6. Various thicknesses of core can be obtained by length of time invested.
7. Eliminates the need for driers or pasting.
8. Shell cores produced offer Unexcelled Permeability . . . Collapsibility . . . Accuracy . . . Easy Shake-Out.
9. Low initial cost . . . $1770, F.O.B. Portland, Oregon.
10. Your Dependable Shell Core Machine comes completely equipped with accessories and assembled ready to operate. Just hook up to gas and compressed air lines. Shipping weight, crated, 500 lbs.

Manufactured by

DEPENDABLE Pattern Works

1634 S. E. SEVENTH AVE. • PORTLAND 14, OREGON

DEALERS:

Frederic B. Stevens, Inc. Detroit 16, Michigan
Don Barnes, Ltd. Hamilton, Ont., Canada
Pennsylvania Foundry Sup. & Sand Co. Philadelphia 24, Penn.
Snyder Foundry Supply Co. Los Angeles 58, Calif.
Canfield Foundry & Equipment Co. Kansas City, Kansas
Pacific Graphite Co., Inc. Oakland 8, Calif. and Los Angeles 22, Calif.
Utah Foundry Supply Co. Salt Lake City, Utah
Frank H. Jefferson, Inc. Seattle 4, Wash.
Sierra Foundry Supply Co. San Gabriel, Calif.
Shallway International Corp. Los Angeles, Calif. and Crawley, England
W. O. McMahon Birmingham 9, Ala.
La Grand Industrial Sup. Portland, Oregon
St. Louis Coke & Foundry Sup. St. Louis, Missouri
Sinclair-Brandt Co. Houston 21, Texas
Smith-Sharpe Co. Minneapolis 14, Minn.
Barker Foundry Sup. Co. So. San Francisco, Calif.

Circle 639 on Page 53

It's a fact...

ALLIS-CHALMERS LIFT TRUCKS MAKE YOU MORE... SAVE YOU MORE

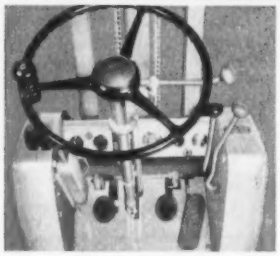
ONE REASON:

Your operator gets more done because he won't be "beat"

Your operator will set a fast, early pace with an Allis-Chalmers lift truck and hold it throughout the day. His seat is roomy and comfortable. He has plenty of leg-stretching room on the clean, lever-free platform. He uses familiar automotive-type controls almost by reflex from the start.

He won't have that production "tail off" toward the end of the shift due to fatigue — as many operators do with hard-to-operate trucks. Instead, he works quickly, easily, safely in the eighth hour just as he did in the first. He gets more done every day because he is never "beat."

Ask your Allis-Chalmers material handling dealer to demonstrate this comfortable, easy-handling lift truck in your plant. Allis-Chalmers, Milwaukee 1, Wisconsin.



Operators easily move pallet loads of castings to the shipping department on the forks of these 4,000-lb trucks. Similar loads can be transported efficiently from shake-out to snagging and grinding rooms or any other area.

Important controls are at the operator's finger tips. He finds them without looking . . . reaches them without stretching . . . works them without straining.

Plan to stay ahead... MODERNIZE!

A-C ALLIS-CHALMERS

8H-108B

Obituary

Frank G. Carrington, 67, until his retirement last year vice president in charge of production, Glamorgan Pipe & Foundry Co., Lynchburg, Va., and vice president and a director of Pontex Pipe Corp., New York, died May 5. Mr. Carrington was an authority on centrifugal casting and served as consultant to pipe foundries in England, France, Belgium, and Germany. In 1937 he returned to the United States and was with Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and Lynchburg Foundry Co., Lynchburg, Va., until 1945 when he joined the Glamorgan company.

Col. Merrill G. Baker, executive vice president of the Steel Founders' Society of America from 1933 until his retirement in 1946, died April 11 in Mill Valley, Calif. For many years Col. Baker was with the Vanadium Corp. of America in an executive capacity. Following service during World War I in the U. S. Army Supply Corps, he represented the United States Steel Corp. in New York. Col. Baker was president of Union Steel Castings Co., Pittsburgh, before joining SFSA.

John F. Ervin, 75, president, Alloy Metal Abrasive Co., Ann Arbor, Mich., died there March 31. Graduated from the University of Illinois in 1904, Mr. Ervin also had been president of the Ervin Foundry & Mfg. Co., Adrian, Mich. In addition, he headed the Standard Abrasive Co. and several affiliated corporations.

S. B. Rymer Sr., 79, chairman of the board of directors, Dixie Products Inc., Cleveland, Tenn., died Apr. 13.

Ralph Burke, 67, former manager of the refinery division, Sivyer Steel Casting Co., West Milwaukee, Wis., died Apr. 6 at his home in Sarasota, Fla. He had retired in 1957 after 23 years with the company.

James O. Scoggins, 42, production manager, Ross-Meehan Foundries Inc., Chattanooga, Tenn., died Apr. 9.

Torque-control Nutsetters
Vertical Grinders
Drills
Nut Runners
Angle Grinders
The Clecomatic*
Impact Wrenches
Air Lubricators, Regulators and Filters
Screwdrivers
Scalers
Chipping Hammers
Wire Brush Machines
Scalers
Safety Coupling
Blow Guns
*Trademark
TOOL USERS KNOW!
The most detailed printed or verbal information can give only an indication of an air tool's performance. To determine its true worth you must use an air tool on the job. Find out—through actual job use—just how outstanding Cleco air tools really are. Call your local Cleco representative for a demonstration-tryout of the Cleco tools of your choice. No obligation, of course.
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P. O. Box 2119
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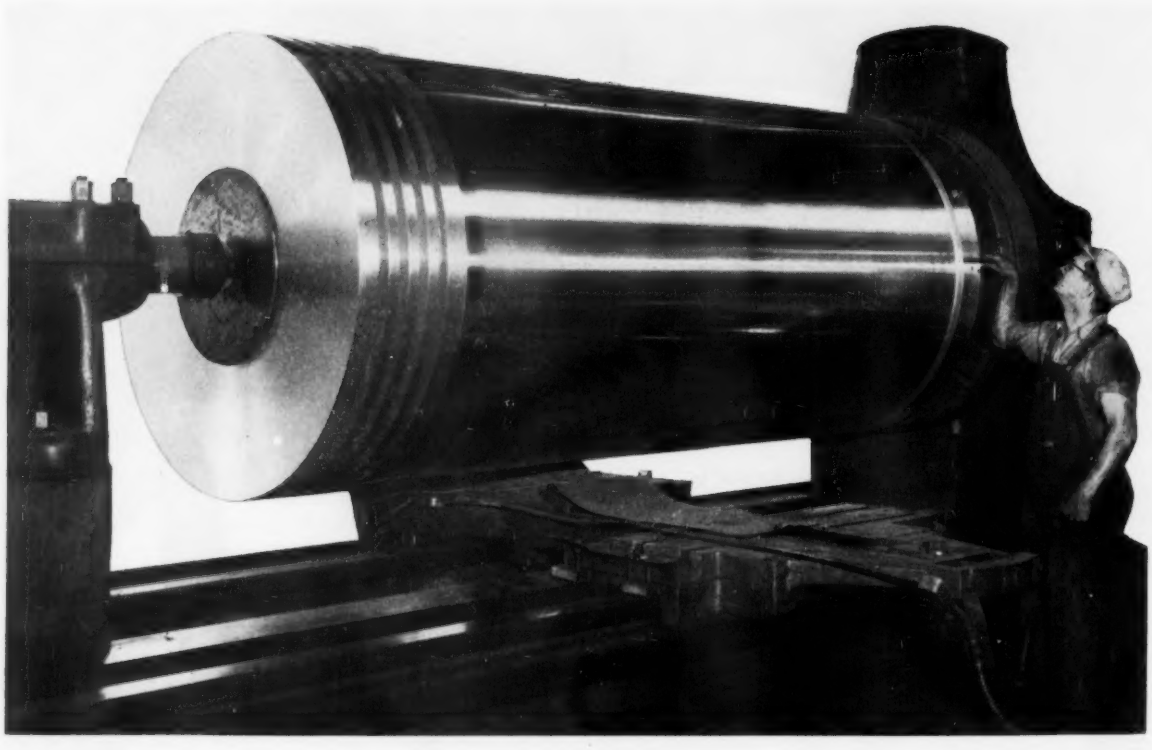
737 Millwood Road
Leaside (Toronto), Ontario



51,300 Pounds of Skilled Workmanship and . . .

This main ram for a hydraulic press was made by the Goslin-Birmingham Manufacturing Company of Birmingham, Ala., under the most exacting specifications. A 32-40 micro-finish was required. Moulding, casting, machining and polishing required the highest foundry and machine shop skills. The iron used was Woodward malleable, which has demonstrated its outstanding dependability in the production of quality castings of all types and sizes.

DEPENDABLE WOODWARD IRON

For quotations, write or call our Sales Department, Woodward, Ala.
Phone Bessemer, Ala. HAmilton 5-2491
or Sales Agents for territory North of Ohio River:
HICKMAN, WILLIAMS & COMPANY with Sales Branches at—

609 Bona Allen Building, Atlanta 3, Ga.; 230 North Michigan Avenue, Chicago 1, Ill.; First National Building, P. O. Box 538, Cincinnati 1, Ohio; 1659 Union Commerce Building, Cleveland 14, Ohio; 1203 Ford Bldg., Detroit 26, Mich.; P. O. Box 335, Duluth 1, Minn.; 412 Guaranty Bldg., Indianapolis 4, Ind.; 70 Pine St., New York 5, N. Y.; 1500 Walnut Street Bldg., Philadelphia 2, Pa.; 1910 Clark Bldg., Pittsburgh 22, Pa.; 902 Syndicate Trust Bldg., St. Louis 1, Mo.

WOODWARD IRON COMPANY

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1882

Men of Industry

● PERCY LANNING
. . . becomes foundry pres.

● FORST L. ROBERTSON
. . . Keokuk Steel v. p.

● ARTHUR E. GILMAN
. . . heads Bay State Abrasive

● WILLIAM A. MADER
. . . Oberdorfer v. p.

● **Percy Lanning,** formerly secretary-treasurer, Perseverance Iron Foundry Co., Philadelphia, has been appointed president of the company.

Joseph L. Mullin has retired as executive vice president, American Manganese Steel Div., American Brake Shoe Co., New York, after 45 years with the division. He will continue as a consultant. In 1928 he became works manager in New Castle, Del., and in 1943 general superintendent of all Amsco foundries. Mr. Mullin was named division vice president in 1945 and executive vice president in 1957.

● **Arthur Van Newkirk** has been appointed foundry superintendent, Abrasive Alloy Castings Co., Bridgeboro, N. J. He had been conducting his own business.

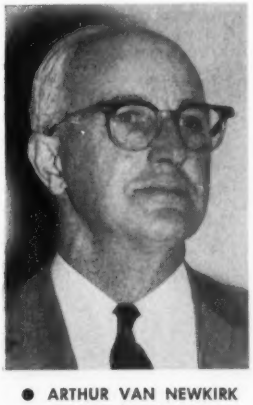
● **Forst L. Robertson** has been named vice president, Keokuk Steel Casting Co., Keokuk, Iowa, in addition to his position as sales manager. He joined the company in 1950 and became sales manager over a year ago. **Karl G. Jansson** continues as vice president-director of sales for Keokuk, Mid-Continent Steel Casting Corp., and Hica Inc., Shreveport, La., affiliates. **Jack Dimond** has been made executive vice president of Mid-Continent Steel Casting. With Keokuk since 1936, he moved to Shreveport in 1950 as works manager, later becoming vice president.

Charles I. MacGuffie, manager special products department, Air Reduction Sales Co., New York, was elected president of the American Welding Society at its recent annual meeting.

● **Arthur E. Gilman** has been named president, Bay State Abrasive Products Co., Westboro, Mass., in addition to his duties as treasurer. He joined the company in 1941.

● **William A. Mader,** until recently chief metallurgist and director of laboratories, Oberdorfer Foundries Inc., Syracuse, N. Y., has been named vice president-technical services. He will represent Oberdorfer and its subsidiary, Oswego Castings Corp. Mr. Mader joined the company 16 years ago.

● **Edward W. Lothman** has been elected senior vice president and **Richard W. Nuffort** vice president-treasurer, Whitehead Metals Inc., affiliate of International Nickel Co., New York. **Casimir J. Bianowicz** has been named general sales manager of Inco's Huntington Alloy Products



● ARTHUR VAN NEWKIRK
. . . new foundry supt.

● CASIMIR J. BIANOWICZ

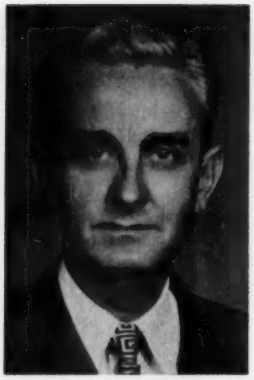
● EDWARD W. LOTHMAN
Whitehead Metals assignments

● RICHARD W. NUFFORT

● JOSEPH L. DOW

● JOHN C. HARWOOD

Elyria Foundry Div. sales



● P. H. JACKSON

● L. D. ALPERT

Federated Metals Div. changes

Div., and a director and assistant vice president of Whitehead. **Edmund L. Carey** has been elected secretary of Whitehead in addition to his position as manager of Whitehead's Harrison (N. J.) branch. **Frank A. Fink** has been made assistant to the vice president and also assistant treasurer.

● **William K. Myers** has been named eastern regional sales manager, Industrial Div., Jeffrey Mfg. Co., Columbus, Ohio. Other appointments as regional sales managers are **Howard S. Davies**, east central; **Elmer F. Longnecker**, central; and **Vernon L. Ekblad**, southern. **Paul Lawall**, manager of field offices, Columbus, has succeeded Mr. Myers as New York district manager. **Paul Hendry** replaces Mr. Davies as Pittsburgh manager, and **William Cheney**, sales engineer, takes over Mr. Hendry's former duties as district manager in Boston. **William W. Etchberger**, for 13 years with the Foundry Sales Div. in Columbus, replaces Mr. Longnecker as Detroit district manager. **Charles E. Lawall**, Philadelphia sales engineer, succeeds Mr. Ekblad as district manager in Houston. **Carl C. Verhine** has been transferred from Duluth to Chicago. Other division assignments are **David J. Shanahan**, Chicago; **James C. Elliot**, Raleigh, N. C.; and **Thomas R. Bodden**, Mobile, Ala.

● **John C. Harwood** and **Joseph L. Dow** recently joined Elyria Foundry Div., Chromalloy Corp., Elyria, Ohio, as district sales engineers. Mr. Harwood, formerly with Hansell-Elcock Co., Chicago, will cover Wisconsin, Illinois, and Indiana. Mr. Dow, who has been with Portland Machine Tool Works, Portland, Me., has been assigned to the New England territory.

H. Edward Ehlers and **Warren A. Zimmer**, vice presidents, have been elected senior vice presidents, and **Sherwood B. Seeley**, technical director, has been named vice president-research, Joseph Dixon Crucible Co., Jersey City, N. J.

● **L. D. Alpert** has been named general manager of the Whiting, Ind., plant, Federated Metals Div., American Smelting & Refining Co., New York, succeeding **S. A. Glueck**, who has resigned. **P. H. Jackson** has succeeded Mr. Alpert as general manager of Federated's eastern department. **G. F. Norman** has replaced Mr. Jackson as vice president-general manager of Federated Metals Canada Ltd. **H. Trihey**, who has been plant sales manager, has become manager of Federated Canada's Montreal plant, the position formerly held by Mr. Norman.

J. Donald Shircliff has been appointed regional automotive sales manager, Reynolds Metals Co., Richmond, Va. He was previously division industrial sales manager for the company in northeastern Ohio and part of Pennsylvania.

Carl W. Kendall, formerly machine shop foreman, has been named plant superintendent, Clearfield Machine Co., Clearfield, Pa. **Thomas E. O'Donnell Sr.** has

● WILLIAM K. MYERS

● HOWARD S. DAVIES

● ELMER F. LONGNECKER

● VERNON L. EKBLAD

Jeffrey regional sales managers

● GEORGE T. DUPRE
. . . district sales mgr.

● EUGENE P. BERG

● G. WALTER OSTRAND
changes announced by Link-Belt Co.

● T. WEBSTER MATCHETT

retired as foundry foreman after 54 years with the company. His son, **Terrence O'Donnell**, succeeds him.

● **George T. Dupre** has been appointed midwest district sales manager, National Engineering Co., Chicago. He has been with National since 1950 and has served as advertising manager, sales engineer, assistant sales manager of the process division, and assistant to the president.

Boyd P. Doty Jr., formerly Cleveland district sales manager, U. S. Steel Corp., has been appointed general manager of sales, American Steel & Wire Div., U. S. Steel.

● **Charles E. Trout, sales engineer,** has been named product manager, graphite electrical brushes, United States Graphite Co. Div., The Wickes Corp., Saginaw, Mich. Other sales engineers who have been appointed product managers are: **Jack C. Schubert,** carbon-graphite; **Richard B. Thomson,** powder metallurgy; and **R. H. Amberger,** graphite products.

● **Eugene P. Berg, since 1950 general** manager of the Pershing Road plant, Link-Belt Co., Chicago, has been appointed general manager of the company's Chicago operations consisting of the Pershing Road and Caldwell plants. **T. Webster Matchett,** assistant manager, has been named manager of the Caldwell plant, succeeding **G. Walter Ostrand,** general manager since 1936, who has retired after 47 years with the company.

Reginald C. Whitson has been appointed marketing manager, Houghton Laboratories Inc., Olean, N. Y. He has been with Warner Brake & Clutch Co.

Richard B. Courchene has been named president, Meta-Mold Aluminum Co., Cedarburg, Wis., in addition to his duties as vice president and industrial relations director, Dayton Malleable Iron Co., Dayton, Ohio, the parent company. **Frank E. Strobhar** has been made assistant industrial relations director for Dayton Malleable. **W. Wells,** assistant industrial relations director for G. H. R. Foundry Div., succeeds Mr. Strobhar there as industrial relations director.

J. G. Buzzard has been appointed sales representative in the Pittsburgh office, Ohio Ferro-Alloys Corp., Canton, Ohio.

W. Ashley Gray Jr. has been named vice president-railroad sales, General Steel Castings Corp., Granite City, Ill. With the company since 1957, he became manager of western railroad sales last year. **H. F. Park Jr.,** vice president-sales, will concentrate attention on expanding activities in sales of iron and steel rolls and special wear-resistant castings. **W. B. Reed,** vice president, assumes responsibility for industrial sales.

Alfred W. Knight, since 1956 executive vice president and general manager, Western Precipitation Corp., Los Angeles, has been elected president, succeeding **Walter A.**

● CHARLES E. TROUT

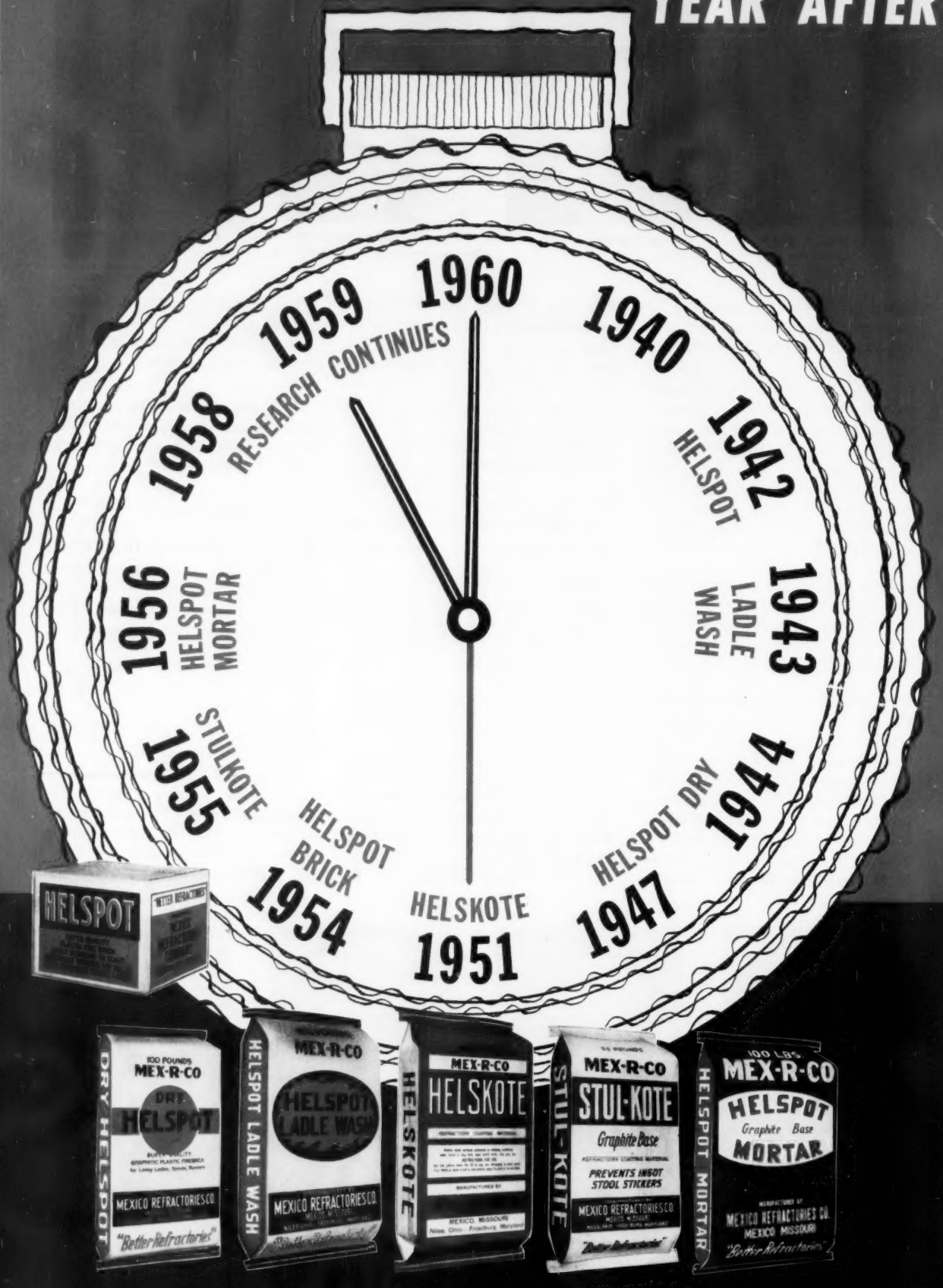
● R. H. AMBERGER

● JACK C. SCHUBERT

● RICHARD B. THOMSON
United States Graphite Co. appointments

Service and

YEAR AFTER



Time Proven YEAR...

MEX-R-CO Graphite-base Products are recognized for their consistent and outstanding quality of DEPENDABILITY wherever molten metal or slag are being conveyed or contained.

In Service HELSPOT Will . . .

. . . ***Minimize Metal Contamination***

Inclusions are practically eliminated, resulting in cleaner metal, fewer rejections

. . . ***Facilitate Slag Removal***

With less skull formation and adhesion longer ladle-life naturally results

. . . ***Resist Thermal Shock***

Super-Duty clay and graphite blend produces unusually high spalling resistance

. . . ***Provide Free-flow Surface***

HELSPOT is non-wetting; molten metal flows without penetrating or sticking

In Service HELSKOTE Will . . .

. . . ***Reduce Stickers by 90%***

Save on stripping time; Put molds in use quicker; More ingots poured

. . . ***Increase Stool Life***

Result will be greatly reduced stool cost per ton of ingots poured

. . . ***Cut Buggy Maintenance***

Broken wheels, axles and springs, and track repair costs will be reduced

. . . ***Reduce Busy-Crane Time***

Faster ingot delivery to soaking pit; Quicker release of molds for re-use

NOW LET'S HAVE A LOOK AT COSTS

The "price per ton" of a graphite-base product should not be the sole criterion for determining its value. Rather, the value of the product should be gauged by its effect upon the over-all costs of production per unit of output.

Basic costs—transportation, handling, brick layer's time, etc.—are the same for an untried, unproven or inferior product as for one of proven and dependable year-in, year-out performance.

Weighing these factors (plus output loss due to more frequent shutdowns for untimely repair or rebuilding), it becomes evident that graphite products of lowest cost DO prove to be the most expensive in the over-all cost analysis.

That is why industry has developed a healthy appetite for graphite-base products with proven service performance, that do cut costs of production, that do hold down inventory costs.

The evidence is conclusive that the over-all costs of containing and/or conveying molten metal CAN be controlled by the utilization of MEX-R-CO Graphite-base Products.

Circle 727 on Page 53

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Division of KAISER ALUMINUM & CHEMICAL SALES, INC.

MEXICO, MISSOURI

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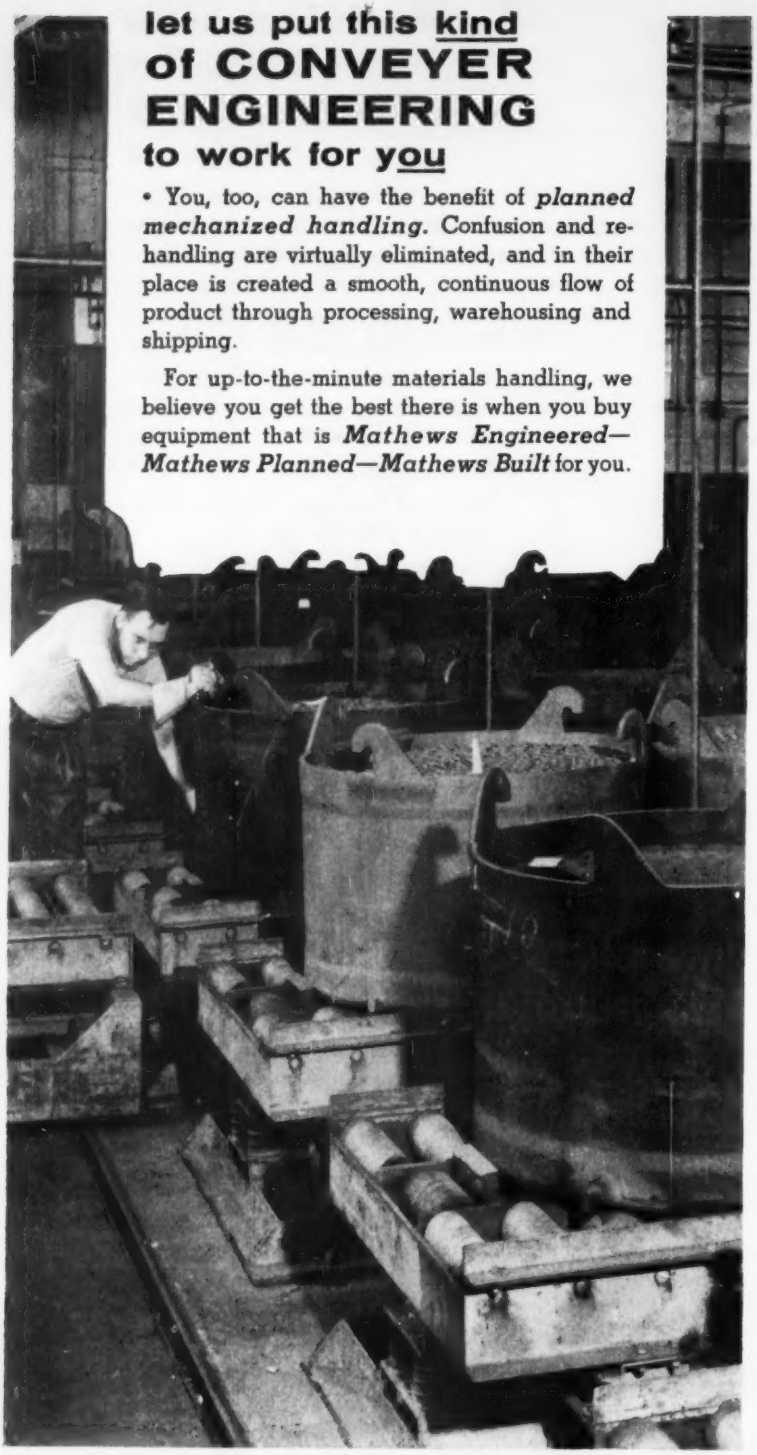
HOUSTON • INDIANAPOLIS • KANSAS CITY • KOKOMO • LOS ANGELES • LOUISVILLE • MEMPHIS • MILWAUKEE
MINNEAPOLIS • NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • PORTLAND • ROCK ISLAND
SAN FRANCISCO • SEATTLE • ST. LOUIS • TOLEDO • TULSA

In Canada: EDMONTON (ALTA.) • HAMILTON (ONT.) • MONTREAL (QUE.) • VANCOUVER (B. C.) • WINNIPEG (MAN.)

LOOK under "Brick-Fire" in the classified section of your telephone directory for name of your local Mex-R-Co Distributor.



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• You, too, can have the benefit of ***planned mechanized handling.*** Confusion and re-handling are virtually eliminated, and in their place is created a smooth, continuous flow of product through processing, warehousing and shipping.

For up-to-the-minute materials handling, we believe you get the best there is when you buy equipment that is ***Mathews Engineered—Mathews Planned—Mathews Built*** for you.

MATHEWS CONVEYER COMPANY

GENERAL OFFICES . . . . . ELLWOOD CITY, PENNSYLVANIA
PACIFIC COAST DIV. . . . MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA
CANADIAN DIVISION . MATHEWS CONVEYER COMPANY, LTD., PORT HOPE, ONTARIO.

MATHEWS

(Member Foundry Equipment Manufacturers Association)

Schmidt, who continues as board chairman. Mr. Schmidt became president in 1911. **William C. Volkel** has been made assistant secretary.

• **John E. Cirner,** formerly with Jervis B. Webb Co., Detroit, recently joined the Detroit office,

• JOHN E. CIRNER

Mathews Conveyer Co., Ellwood City, Pa., as a sales engineer. **Harper Poling** has been named sales engineer in the Chicago of-

• HARPER POLING

fice. Mr. Poling had been with Link-Belt Co., Chicago, as an engineer.

C. A. Johnson has been named resident manager, U. S. Pipe & Foundry Co., Chattanooga, Tenn., succeeding **H. M. Barker.**

R. G. Maus has been named western division sales manager, Cleco Air Tools, Div. of Reed Roller Bit Co., Houston. He was formerly in New Orleans as field engineer. **David J. Richards** and **Richard O. Erickson** have been appointed sales-

Circle 645 on Page 53

men in the Chicago area. **Dan Rini** has been named factory representative in the Cleveland and northeastern Ohio area.

Thomas Evans has been elected chairman and chief executive officer, Crane Co., Chicago. He is board chairman of H. K. Porter Co., Pittsburgh. **L. H. T. Clegg,** former president of Crane's Canadian subsidiary, has been named acting president of the parent company, succeeding **Neele E. Stearns,** resigned.

• **B. H. Wildenhaus,** since 1940 district manager, Grinding Wheel Div., Simonds-Worden-White Co.,

• **B. H. WILDENHAUS**
. . . distributor sales mgr.

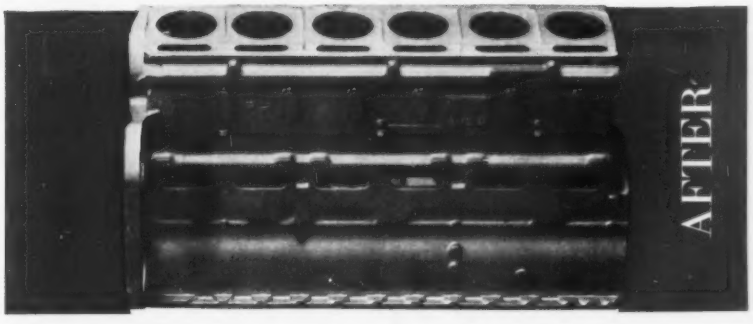
Dayton, Ohio, has been named manager of distributor sales. He joined the company in 1927.

George E. Austin has been named district manager in Spokane, Wash., for Link-Belt Co., Chicago. He succeeds **Homer A. Garland,** who, for reasons of health, has relinquished these duties and will continue as supervisor of the Spokane factory branch store. Mr. Austin has been district sales engineer in Spokane since 1951. With the company 37 years, Mr. Garland became district manager in 1942.

George J. Morton, president, J. B. Rea Co., Santa Monica, Calif., parent organization of Ferro-Cast Corp., investment casting producer, has been elected president, Idaho Maryland Mines.

John H. Schuler, Anderson Electric Co., Birmingham, and **Robert G. Scott,** Marion Power Shovel Co., Marion, Ohio, were elected administrative council members,

GOLDEN FOUNDRY CO., INC.
SAVES $5,000 ANNUALLY
WITH WHEELABRATOR STEEL SHOT®



Wheelabrator Steel Shot saved Golden Foundry Co., Inc., Columbus, Indiana, $4,957.00 in their cleaning costs in one year.

How was it done? By changing from a malleable type abrasive to Wheelabrator Steel Shot.

Tests made over a period of a full year showed conclusively that Wheelabrator Steel Shot reduced abrasive consumption from 18 lbs. to 10 lbs. per wheel-hour over a malleable type abrasive. This 45% reduction in abrasive used brought actual savings of 28.4¢ per wheel-hour of operation.

More than 1,200 firms now have standardized on Wheelabrator Steel Shot, and are making similar impressive savings. Consistently harder, with greater resistance to breakdown, Wheelabrator Steel Shot lasts longer in use, cleans better, and reduces total cleaning costs. Your Wheelabrator Abrasive Engineer will help you achieve similar savings.

Send for complete information on how Wheelabrator Steel Shot can solve your cleaning problems.

ABRASIVE DIVISION

WHEELABRATOR
CORPORATION

505 South Byrkit Street Mishawaka, Indiana

Canadian Division: Box 490, Scarborough, Ontario

World's Largest Manufacturer of Quality Steel Abrasives

Circle 646 on Page 53

SEND FOR CATALOG

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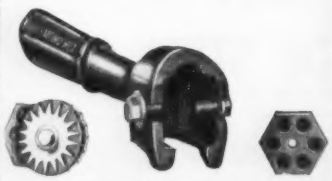
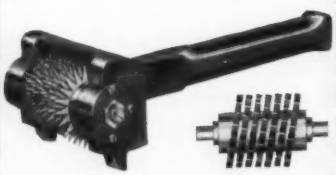


Desmond Hex Dresser

LIVES FOR FOUNDRY GRINDING WHEEL



Desmond Heavy Duty Dresser

DRESSERS

Cut grinding and snagging costs with inexpensive Desmond Hex dressers. They bring grinding wheel faces to "new" efficiency by removing loaded metal and exposing sharp abrasive grains. And Hex dressers provide **six** sets of bearings in one set of bearing blocks . . . for extra life on average wheels. For resinoid and rubber bonded high-speed wheels use the ball-bearing Desmond Heavy Duty Dresser. Ask your Desmond distributor's advice.

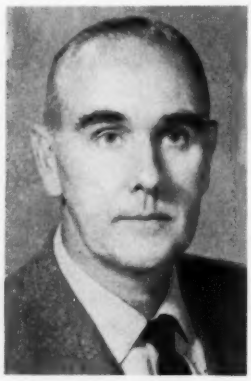
Desmond

Desmond-Stephan Mfg. Co.
Urbana, Ohio

Circle 647 on Page 53

National Foundry Association, Chicago, succeeding **R. L. Jackson**, Jackson Industries Inc., Birmingham, and **D. Russell Gochnour**, who resigned from Marion Power to relocate in California.

• **L. S. Hilton,** formerly sales manager, has been appointed manager of the abrasive and diamond wheel departments, Manhattan Rubber Div., Raybestos-Manhattan Inc., Passaic, N. J., succeeding **J. A. Lange**, who will devote his time to improving methods and quality.



• **L. S. HILTON**
. . . becomes department mgr.

C. Fleming Jr. has been named production and development manager. **S. R. Delaney** has been named sales manager, and **A. J. Verrinder**, assistant sales manager. **D. B. Bell** and **L. A. Benson** have been made technical superintendents. **T. Gordon** has replaced **H. Ahlers**, retired, as field engineer.

John Fuqua has been named chief plant metallurgist, Cooper Alloy Corp., Hillside, N. J. Previous connections include senior research metallurgist, American Steel Foundries, East Chicago, Ind., and works manager, Hica Inc., Shreveport, La.

C. A. Pickett has been made manager of the Merchandise Div., American Air Filter Co., Louisville, Ky. He was formerly manager of the company's field sales administration.

Henry B. Puff, since 1956 Chicago district sales manager, Hooker Chemical Corp., Niagara Falls, N. Y., has been named assistant product manager - resins for the Durez Plastics Div., North Tonawanda, N. Y. **Edwin E. Woodman,**

Eliminate oxides, dirt and other impurities from aluminum and zinc melts with

Foseco®
COVERALS

and get metal-free drosses, too!

This bulletin tells you how. Send for your free copy today.

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FOUNDRY SERVICES, INC.
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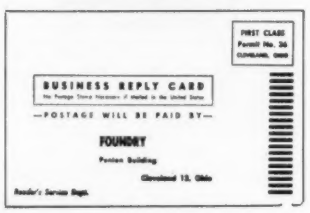


Use an Inquiry Card

For further information on anything described or advertised in this issue . . . . . .

SEE Page 53

in the company's Chicago sales district for more than 20 years, has been named Chicago district sales manager.

E. J. Teller has been appointed vice president in charge of West Coast operations, U. S. Reduction Co., East Chicago, Ind. **J. S. Solomon** has succeeded Mr. Teller as director of purchasing in the East Chicago headquarters of the company.

Carl S. Newmarch, formerly assistant branch manager, has been named manager of the Philadelphia branch, Whitehead Metals Inc., affiliate of International Nickel Co., New York. **J. I. Doherty** has been made manager of the Cambridge, (Mass.) branch, succeeding **R. F. Blessington** who until his retirement in October will be associate manager there. **C. C. McCarthy,** since 1956 product manager for aluminum in New York, has succeeded Mr. Doherty as Windsor, Conn., branch manager.

• **William S. Hallowell** has been appointed abrasive engineer in the Indiana area, Sterling Grinding

• **WILLIAM S. HALLOWELL**
. . . grinding wheel sales

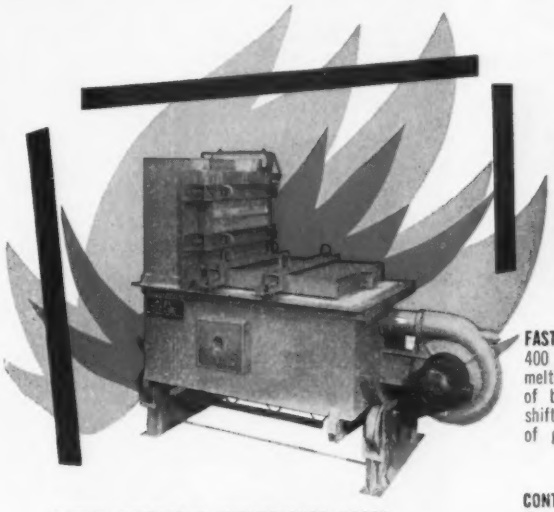
Wheel Co., Tiffin, Ohio. For the last two years he has represented the company in the San Francisco area.

William A. Jaynes recently joined Bohn Aluminum & Brass Corp., Detroit, as representative in the sales office there.

Edward D. Rollert, since 1955 general manager of the Harrison Radiator Div., General Motors Corp., Lockport, N. Y., has been

SAVE $ WITH REDA FURNACES

FUEL SAVINGS UP TO 50% REPORTED USING REDA GAS-OIL FIRED FURNACES!



BEST HEAT EFFICIENCY

FASTER MELTING — One 400 series Reda Furnace melts up to 11,000 lbs. of brass or bronze per shift, and up to 6,000 lbs. of gray iron per shift.

LOWER MELTING & MAINTENANCE COSTS— One man can operate a Reda Furnace . . . No daily repairs needed!

CONTINUOUS POURING— No waiting until floors, flasks, boards, etc. are filled with molds!

FURNACE DIVISION WRITE TODAY FOR DESCRIPTIVE BULLETIN
REDA PUMP COMPANY - BARTLESVILLE, OKLAHOMA

Circle 649 on Page 53

Why STERLINGS are MAN'S BEST *Materials-Handling* FRIEND!

Ask about liberal dealer sales plan

1. **ALWAYS READY** to use . . . no fuel or other "operating supplies" needed.
2. **NO "STARTING"** Problems . . . regardless of cold, heat, rain, dust.
3. **NO "HOUSING"** Problems . . . no protective warehousing needed, no covering, no "babying".
4. **NO MAINTENANCE** Problems . . . nothing to get out of order . . . rugged, long-lasting.
5. **EASIEST WHEELING** . . . with choice of pneumatic, semi-pneumatic or steel-tired wheels (with plain, ball or roller bearings.) These are the easiest rolling wheelbarrows made!
6. **EASIEST** on the barrow man . . . engineered to balance 4/5th of load on the wheel; only 1/5th of load at handle grips.
7. **EASIEST CLEANEST-DUMPING** . . . steel trays engineered to unload completely, with least effort.

Costs Less per Year

STERLING NATIONAL INDUSTRIES, INC.
Milwaukee 14, Wisconsin

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

A-8245-1/3

Circle 650 on Page 53

appointed general manager of GMC's Buick Motor Div., Flint, Mich., succeeding **Edward T. Ragsdale,** who retired after 36 years with the division. Mr. Rollert joined General Motors in 1934.

• **Kenneth F. Echard** has been appointed manager of sales, Tonawanda Iron Div., American Radiator

• KENNETH F. ECHARD

& Standard Sanitary Corp., North Tonawanda, N. Y., succeeding **Frank P. Breier,** who retired for health reasons. Mr. Echard had been in charge of eastern sales. **D. Russell Smith,** formerly with North Attleboro Foundry Co.,

• D. RUSSELL SMITH

North Attleboro, Mass., has been named eastern sales representative for the division to cover New England, New Jersey, and eastern New York.

Richard B. Hardy, field engineer in Philadelphia, has been named an abrasive engineer for the metropolitan area there, Norton Co., Worcester, Mass. **Stephen W. Anderson** has been appointed abrasive

Circle 651 on Page 53

engineer in Wisconsin, Minnesota, and North Dakota, with headquarters in Minneapolis.

• **Philip A. Newhart,** until recently with Koppers Co., Baltimore, has been appointed a metallurgical engineer for the Pig Iron & Coal

PHILIP A. NEWHART
. . . joins Republic Steel

Chemicals Sales Div., Republic Steel Corp., Cleveland. Previously he was with Perfect Circle Corp., Newcastle, Ind.

• **Lawrence W. Smith** recently joined National Carbon Co. Div. of Union Carbide Corp., New York, as

LAWRENCE W. SMITH
. . . National Carbon sales

sales representative in the Philadelphia area.

F. W. Laverty, executive vice president, has been named president, Clark Bros. Co., Olean, N. Y., affiliate of Dresser Industries Inc., Dallas, succeeding **J. N. MacKendrick,** who has been president since 1953. Mr. MacKendrick has become board chairman, replacing **C. Paul Clark,** who has been made honorary chairman.

PATCH AND PLACE UP TO 5000 LBS. OF REFRACTORY MATERIAL AN HOUR WITH THE "CEMENT GUN"®

Your own men can learn to operate the "CEMENT GUN" quickly and easily. After that, two or three of them can make all your cupola and ladle repairs in quick time. Using the "CEMENT GUN," they can place a lining 1" to 6" thick in one continuous operation, placing as much as 5000 lbs. of refractory material an hour. Write today for special FREE bulletin describing the "CEMENT GUN," its operation, prices, etc.

CEMENT GUN COMPANY
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Circle 652 on Page 53

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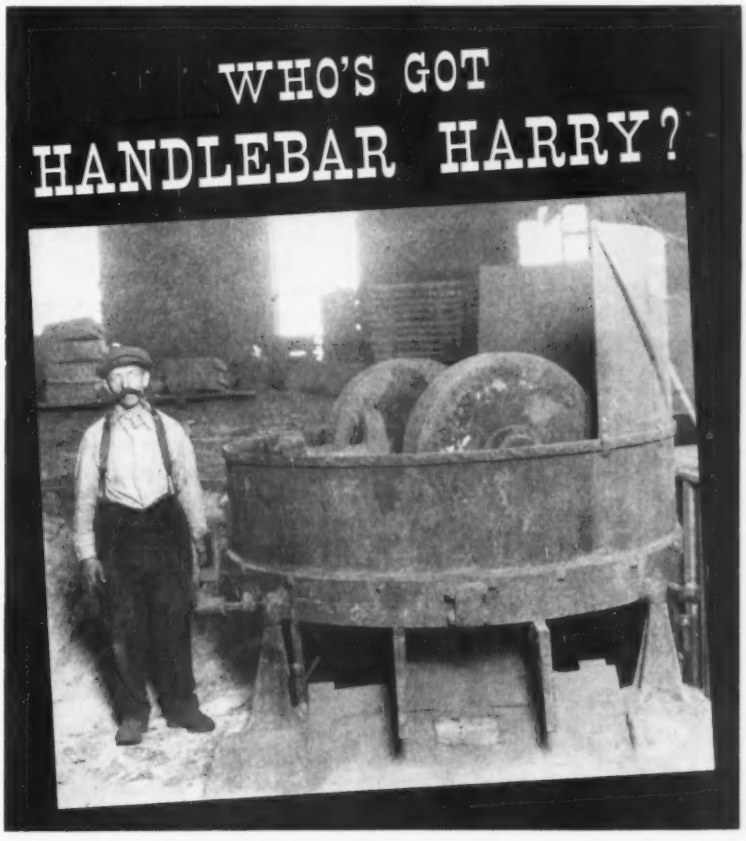


This machine produces pipe from 2 to 6 inches inclusive in diameter

CAST SOIL PIPE CENTRIFUGALLY

THIS MODERN METHOD PROVIDES

We supply complete equipment and technical information for production of centrifugally cast soil pipe.

Product Uniformity
Perfectly Concentric Pipe
No Sand Blasting or Other Cleaning Necessary
Use of Unskilled Labor
Small Man-Hour Cost
High Production
Low Investment

WRITE TODAY FOR ILLUSTRATED BULLETIN

CENTRIFUGAL CASTING MACHINE COMPANY
P. O. BOX 947
TULSA, OKLAHOMA

Circle 653 on Page 53

The Sandman Says

By HAROLD E. HENDERSON
H. C. Macaulay Foundry Co.
Berkeley, Calif.

"Casting Early Cannon"

● IN REPLY to a querulous letter of mine, Frank Steinebach once smoothed my ruffled feelings with a helping of his kindly philosophy.

He wrote, in part, "This foundry family of ours covers a lot of territory and is comprised of a lot of people. They are individually as different as the members of any other family, and perhaps just as unpredictable. Some of them write home occasionally to tell us what they are doing, but most of them are just too busy to be bothered. However, all of them like to get letters and to be fully informed. That's why we publish and distribute FOUNDRY—so that Bill will know what Joe is doing, and how, when, where, and why he's doing it. The more of these people you get to know, the more you'll realize what a wonderful family you belong to."

Several months ago, I made an appeal for information concerning the production of cannon, especially those of early vintage. Although the appeal excited but slight response, a few generous souls sent me photostated copies of government reports on the subject. All of these were informative and obviously reliable, but mainly of a statistical nature, with only slight mention of foundry procedure. I had about given up hope of satisfying my cannon curiosity when fortune favored me with a visitor from Boston.

His name is Rosmond M. MacDonald, and he is a foundry engineer for Hunt-Spiller Mfg. Corp. of Boston. Mr. MacDonald is a modest gentleman of quiet deportment with whom anyone should feel at ease. He also reads my column. What more could I say of any man?

Our conversation naturally concerned gray iron jobbing foundries, inasmuch as he insisted that our two shops are similar in many respects. I soon learned, however, that the assumed similarity hardly could be supported in fact. The difference may be *slight*, but I think you'll find it interesting.

On his return to Boston, Mr. MacDonald, in keeping with a promise, sent me the story of Hunt-Spiller and the pioneer casting establishments from which it sprang. He also enclosed a synoptic history of gunmaking in America, dating from early Colonial days to our comparatively recent experience in this field. This review was compiled by Job Goostray, R. F. Harrington, and M. A. Hosmer, all of Hunt-Spiller, and contains foundry flavor and information that I have been unable to find elsewhere.

Starting with the Alger Foundry in 1810, which became the South Boston Iron Works in 1827 and finally incorporated as the Hunt-Spiller Co. in 1892, this organization has had a long and exciting history in the production of unusual castings. It has been fortunate in having leaders of tremendous imagination and initiative. Their paths were not always strewn with roses, nor where they immune to the trials and tribulations of foundrymen elsewhere.

Impelled by demands of the Ordnance Department in 1812, Cyrus Alger's foundry produced huge

4 NEW SERIES IR GRINDERS

to give you an ANNUAL DIVIDEND on your PAYROLL DOLLARS

NEW *DESIGNS SPEEDS POWER*

NEW

4S Series Grinder

60% more output . . . for $3000 Dividend Dollars/year.

NEW

001 Series Grinder

25% more output . . . for $1250 Dividend Dollars/year.

NEW

42F Series Grinder

25% more output . . . for $1250 Dividend Dollars/year.

NEW

2G Series Grinder

17% more output . . . for $850 Dividend Dollars/year.

If your operators are using older model grinders, you can increase their man-hour productivity by as much as $3000 Payroll Dollars in one year, just by replacing the older tools with one of the new I-R designs.

Multiply these *Annual Dividends* by the number of grinder operators in your plant, and you can see why management today is taking a new look at portable tool operations.

There's a fast, easy way to calculate the amount of *Dividend on Payroll Dollars* these new I-R grinders can help you earn in just one year—without adding to your present payroll.

It's yours without obligation. To get it, call your I-R AIRengineer today. Or write Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Ingersoll-Rand

Tools plus AIRengineering increase output per man

8-923

quantities of cannonballs. "This contact led Alger to turn his inventive mind to the creation of iron particularly suited to guns. The next year he discovered a method of purifying iron in a reverberatory or air furnace which produced iron three times as strong as ordinary iron. This product was then known as Air Furnace Gun Iron and now for many years has been known as Hunt-Spiller Gun Iron. It is used exclusively in the company's iron products today. In 1828 the United States Government gave Mr. Alger the first order to cast large cannon—up to 11-in.

"The foundries casting ordnance between 1840 and 1850, in addition to South Boston Iron Works, were Fort Pitt Foundry, Pittsburgh, and West Point Foundry, Cold Springs, N. Y. These foundries used charcoal iron for the gun castings which was obtained from the Greenwood Furnace near Cold Springs, N. Y., the Franklin Smelting Furnace, New Jersey, and the Ammenia Furnace and Richmond Furnace, Richmond, Mass.

"The process whereby guns were cast solid and bored out continued, but, cast iron being somewhat porous, the exterior usually became chilled during the cooling process by sudden contact with the mold and was converted into a solid crust before the interior had dropped even to the melting temperature.

"The result was that the solid gun frequently consisted of various strata, of different densities. Even though great care was exercised by the founder, it was not unusual to find a spongy portion consisting of incoherent crystals so loose that dark cavities could be seen with the naked eye. A sharp-pointed steel chisel could be driven into the spongy portion easily. It was not until Lieutenant Rodman came forward with a most remarkable process that extreme endurance was obtained with guns manufactured from cast iron.

Rodman Gun Was Cast Hollow

"In 1849, Thomas Jefferson Rodman, a West Point graduate, invented a process of casting hollow cannon by means of a core around a tube, or what might be called a core arbor. Water was run in through a pipe in the inside of the tube to about 5 or 6 in. from the bottom, the tube having a closed end so that no water could leak out. The water circulated during casting to a side outlet near the inlet, a sufficient supply being sent through to keep it cool.

"Hence with the inner portions of the casting cooling and solidifying first, they were compressed and supported by the contraction of the exterior when it cooled. The casting was further secured from irregular and excessive strains by a fire built around the flask to keep it hot so that as uniform cooling as possible would take place. About 24 hours after casting, the arbor was removed, a pipe was put in the bore of the casting that was formed by the core, and water was kept running until the casting was cold.

"The first guns made by Rodman's process were cast at the Fort Pitt Foundry on Aug. 4, 1849. They were two 8-in. Columbiads. Some of the experimentation connected with the manufacture of these guns and also the manner in which they

In tough grinding nothing beats a FOX

- Constant Peripheral Speed
- Maximum Clearance
- Vibration Free Spindle
- High Production • Low Maintenance
- Operator Safety

FOX #1-24
10-15-20 horsepower: Grinding wheel 24 x 3 x 12".

FOX #1-30
15-20-25 horsepower: Grinding wheel 30 x 3 x 12".

FOX GRINDERS, Inc.
OLIVER BUILDING PITTSBURGH 22, PA.

were tested are described in detail by Rodman in his reports.

"The two molds were placed side by side in a pit and the iron charged in two air furnaces, each containing 14,000 lb of the same kind of iron. After melting, the liquid iron remained in the furnaces one hour, exposed to a high heat, and then was discharged by separate streams into a common reservoir. From this reservoir it issued in a single stream which, after proceeding a few feet, separated into two branches, each leading to a separate mold.

"Both molds were filled at the same time; one was cast solid, and one was cast hollow and cooled by the Rodman process. The testing of the guns commenced Sept. 7. The one cast solid burst at the 85th firing; the one cast hollow and cooled by the Rodman process burst at the 251st firing. The density of the iron used was 7.223; the tenacity, 27,488 lb.

"Doctor Moldenke tells us, 'Between 1862 and 1877 alone, no less than 272 Rodman guns, of which 103 were of 15-in. size and weighed about 50,000 lb apiece, were produced at this establishment.'

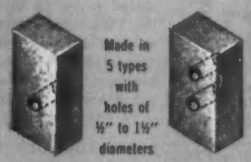
Dahlgren Gun Cast Solid

"The Dahlgren gun was of gray iron and was designed about 1840. It differed from the Rodman gun in that it was cast solid, cooled from the outside, and bored out. Both types were smooth-bore guns, and each was named for the officer who designed it—Rodman of the Army and Dahlgren of the Navy. W. P. Hunt tells us, 'The 11-in. Dahlgren gun carried by the *Monitor* in her fight with the *Merrimac*, and the guns of the same type which sunk the *Alabama*, were made at the South Boston Works.'

"When the Civil War broke out in 1861, South Boston Iron Works was called on to make extensive additions to its plant and to undertake construction of cannon of much larger bore than had then been made. A new foundry was built and equipped with three air furnaces, each of 45-ton capacity, and a large number of 15-in. guns were made, each weighing about 50,000 lb. Previous to the war, the ordnance work of the government

GET SET FOR TROUBLE-FREE TAPPING

with IRONTON TAP HOLES, SLAG HOLES AND SPOUT BRICK for CUPOLAS

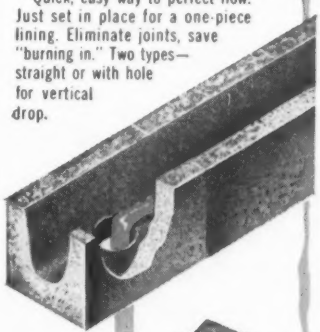


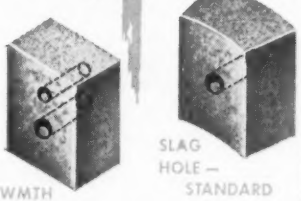
Made in 5 types with holes of ½" to 1½" diameters

STANDARD TAP HOLES

SPOUT BRICK

Quick, easy way to perfect flow. Just set in place for a one-piece lining. Eliminate joints, save "burning in." Two types—straight or with hole for vertical drop.





WMTH (TAPERED HOLES)

SLAG HOLE—STANDARD

PROMPT DELIVERY FROM OUR LARGE STOCK OF STANDARD SIZES OR WE WILL MAKE TO ORDER

THE IRONTON FIRE BRICK COMPANY
SINCE 1917
IRONTON, OHIO

1311 Ashtabula Street

WRITE OR CALL IRONTON, COLLECT, for name of nearest representative

Circle 656 on Page 53

YOU SAVE $$$ because this plastic STAYS MOIST 2 YEARS

PALLETIZED FOR EASY HANDLING

IT'S ALWAYS SAFE to save money by ordering **Ironton NOJOINT** in 550 pound drums because this plastic refractory stays moist and usable for **TWO YEARS!**

SAVE THREE WAYS WITH NOJOINT IN DRUMS

1. No loss from drying out. Tight lid keeps **NOJOINT** always ready for day-to-day jobs.
2. Skip the warehouse charges, purchase larger quantities direct from Ironton.
3. Freight cost per ton is lower on single large shipment than on small re-orders.

WHEREVER HOT METAL RUNS in your foundry, use **NOJOINT.** Best for lining ladles, cupola spouts, tapholes, slag holes... and for patching the cupola well.

OTHER CONVENIENT PACKAGES OF NOJOINT

- 100 lb. cartons MOIST in slices 2" thick.
- 100 lb. bags, DRY. Mix with moisture content and other additions as you prefer.

Ironton engineers will visit your foundry and show your men how to use **Ironton NOJOINT** and where. Write or call today for the latest bulletin and additional information.

THE IRONTON FIRE BRICK COMPANY
SINCE 1917
IRONTON, OHIO

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Write or call Ironton collect for name of nearest representative.

Circle 657 on Page 53

NARCOLINE NARCOLINE NARCOLINE NARCOLINE

Slag-Resistant Plastic Refractory

NARCOLINE Assures Cleaner Castings

It successfully resists the erosive and corrosive action of metals and slags, eliminating refractory inclusions from the casting.

NARCOLINE Facilitates Metal Flow

It resists graphite burnout under operating conditions, and maintains a lasting lubricated surface for easy metal flow.

NARCOLINE Assures Easy Slag Removal

It resists the wetting action of molten metal and slag, permitting ladles to be cleaned of solidified metal and slag with little effort.

NARCOLINE Easy to Install

It can be rammed to any desired shape with mallet or air hammer. Requires no special training to install.

Send for bulletin No. 106 Rev.

NORTH AMERICAN REFRACTORIES CO.

General Offices, Cleveland 14, Ohio

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191 Victoria Ave., South, Hamilton Ontario

Circle 658 on Page 53

was handled by four foundries, South Boston Iron Works, West Point Foundry, Fort Pitt Foundry, and Tredegar Foundry, at Richmond, Va.

"Other foundries were pressed into service for the war only and for the construction of guns of small caliber almost exclusively. During the war, West Point Foundry was devoted to the manufacture of the Parrott gun. The government then was largely dependent on the South Boston Iron Works for its heavy ordnance, and the South Boston Iron Works also made large quantities of projectiles, rifle guns, and the Schenkl projectile."

In 1880 South Boston Iron Works produced two 10-in. and two 12-in. guns of cast iron. "Owing to the extensive preparations necessary in the work of casting these guns, they were not completed until 1884. A detailed description of the casting appeared in FOUNDRY, January, 1918. The article was written by Job Goostray, assistant to James Wood, who had charge of the work. Mr. Wood was foreman of the ordnance casting department of South Boston Iron Works.

Guns Weighed 28 and 54 Tons

"The first gun was cast by the Rodman method and when finished was 25 ft. long and weighed 28 tons. It was taken to the Watertown Arsenal to be wound with wire and was known as a 10-in., wire-wound rifle.

"The second gun was to be a 12-in., breech-loading rifle to be cast breech up. This also was cast by the Rodman process and when finished weighed 54 tons and was 30 ft. long. A contract was made with a building mover to remove the gun from the pit and place it in the lathe for $550. It took the contractor five weeks to accomplish the work.

"The third gun also was a 12-in., breech-loading rifle and was to be cast breech down. It was the heaviest gun cast in the United States up to that time. This was not as successful as the two previous castings, for about an hour after the cast, the flask gave way, the iron going to the bottom of the pit.

"Since there were approximately 120 tons of iron involved in the casting, quite a loss was repre-

OVER 60 YEARS SERVICE TO INDUSTRY

GRINDERS

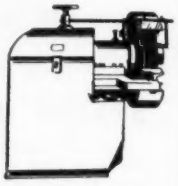
EASIER, FASTER, MORE ECONOMICAL FOR ALL GRINDING OPERATIONS

General Purpose Grinder

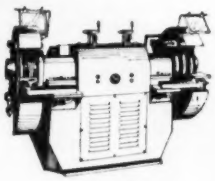
MODEL 500

General Purpose Floor Grinder, totally enclosed motor, 1 to 5 hp. Push button starter with overload protection. Enclosed ball bearings. Enclosed adjustable wheel guards.

United States Single End and Dual Motor Vari-speed Snagging Grinders provide constant peripheral speed, regardless of wheel diameter resulting in increased production and longer wheel life. Maximum peripheral speed for vitrified or high speed grinding wheels can be maintained for the entire life of the wheel.



Vari-Speed Single End Grinder



Dual Motor Vari-Speed Grinder

Swing Frame Grinder

Perfect balance, light, flexible, lateral or rotating. Perfect visibility. Single suspension at center. Angular adjustment.

WRITE FOR CATALOG OF THE COMPLETE LINE

The United States Electrical Tool Co.

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Circle 659 on Page 53

sented by the accident. This mishap caused some delay in carrying out the work, and it was not until October, 1884, that work on the contract was resumed. The next gun attempted was one of the hoop and tube style. The casting weighed approximately 76 tons and was entirely successful."

From Alger Foundry to South Boston Iron Works to Hunt-Spiller Corp., this remarkable organization has concerned itself successfully with many facets of the casting industry. Cannonballs and guns of various dimensions was one phase; railroad equipment was another; then marine and automotive work were added, in addition to general jobbing.

It is, in short, a story of men who seemingly refused to admit that there was anything that couldn't be done. Cyrus Alger, a true pioneer metallurgist, became the irresistible force with his innovations and improvements in metal casting.

Non-Ferrous Founders Plan Annual Meeting in October

Non-Ferrous Founders' Society will hold its annual meeting at the Bedford Springs Hotel, Bedford Springs, Pa., on Oct. 23-24. Meetings of directors and committees will be held on Oct. 21-22.

Robert Langsenkamp, president, Langsenkamp-Wheeler Brass Works Inc., Indianapolis, is annual meeting chairman of the society. He has indicated that the program is being developed around a marketing-costs-production theme.

G. F. Langford, president, Superior Kendrick Bearings Inc., Detroit, and president of the Cast Bronze Bearing Institute, a product group of NFFS, has announced that the institute will hold its annual meeting at Bedford Springs on Oct. 21.

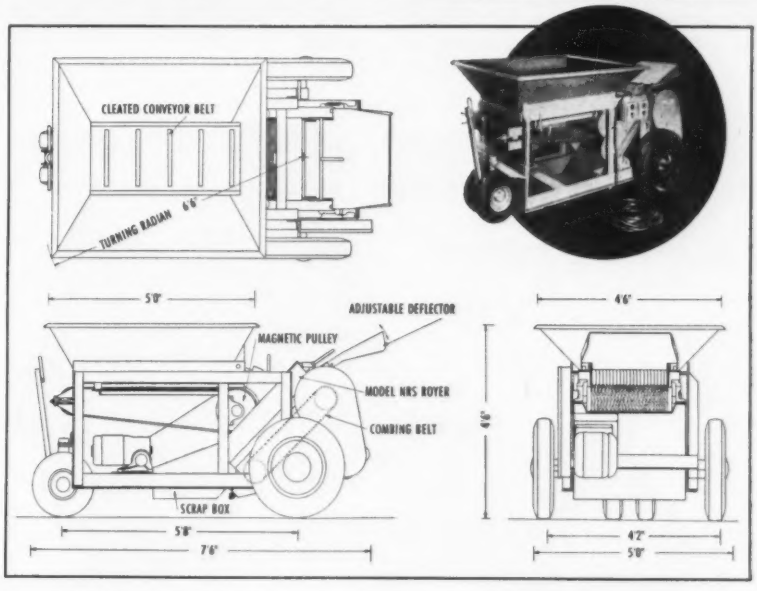
How To Use Strain Gages

Two one-week courses on strain gage techniques will be held at the University of California at Los Angeles on Aug. 17-21 and Aug. 24-28. They will be sponsored by UCLA and the Society for Experimental Stress Analysis. First session will be a lecture course, the second a laboratory course.

SAND CONDITIONING TOPICS

PUBLISHED BY ROYER, MANUFACTURERS OF THE FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER



Sand Conditioning costs can be reasonable

When any industry suffers a business recession, however slight, the attention of its leaders automatically shifts to cost cutting and the elimination of waste. Many foundrymen peer wistfully at the large, highly mechanized foundry and imagine semi-automation is the answer.

Looking at the foundry industry realistically, this form of advanced mechanization is not the answer. Seventy-two per cent of the nation's foundries employ less than 50 men—for most of these, advanced mechanization is both a physical and an economic impossibility.

For these foundries, units like the highly efficient Royer MAGNA-SAN are the practical solution to most sand conditioning cost problems. Here is a unit that is foundry-engineered to magnetically clean. mix, blend and aerate shakeout sand right on the molding floor—and at a lower initial cost and with less maintenance than any other mechanical method.

The Royer MAGNA-SAN is ideally designed for use in the small and medium sized foundry—this 73 per cent who most need the advantages of mechanization but cannot pick up the bill. Compare this compact unit, in the drawing above, with your available working space. Notice how the compact design permits easy maneuvering about crowded casting floors.

Capacity-wise, the Royer MAGNA-SAN conditions 45 tons of sand per hour—a full 8 per cent more than its closest competitor. And remember, it is a fact that economy of operation is determined by performance, which is measured by comparative expense per ton of sand conditioned.

We invite you to see for yourself how reasonable sand conditioning costs can be. Send the coupon and we'll rush your copy of the MAGNA-SAN Bulletin RM57 to you by return mail.

ROYER FOUNDRY & MACHINE CO.

ROYER 159 PRINGLE STREET KINGSTON, PENNA.

I want to know more about reasonable sand conditioning costs. Rush me your MAGNA-SAN Bulletin.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

Circle 660 on Page 53

New Books for Foundrymen . . .

PURCHASING

Purchasing for Profit, paper, 115 pages, 6 x 9 in. AMA Management Report No. 20, published by the American Management Association, Manufacturing Division, 1515 Broadway, New York 36. Price $2.25.

This report, providing practical guides for purchasing cost reduction, is based on material presented at a recent conference on "Cost Reduction Through Effective Purchasing and Materials Management."

The text shows how companies have organized and administered their purchasing departments successfully. Important tools for reducing purchasing costs are described, including value analysis, make-or-buy decisions, purchasing research, electronic data processing, standardization, and advanced statistical and mathematical techniques. The text also considers cost reduction in the area of vendor relations and analyzing personal qualifications of the modern purchasing agent.

MANAGEMENT SKILLS

Appraising Executive Performance, by Carl Heyel, cloth, 189 pages, 5½ x 8½ in., a handbook published by the American Management Association, 1515 Broadway, New York 36. Price $4.50.

How good are the members of the executive team? This book provides the information to assist every executive to size up the capabilities of his subordinates and to show him what he can do to develop his own full potential.

The author shows how to establish realistic yardsticks for measuring executives' performance, and how to judge specific skills, including technical knowledge and experience, ability to make decisions, and co-ordinate and direct personnel. The author also examines ways of relating the executive's personal traits to his work, of exploring his attitudes, motives, and understanding of the job.

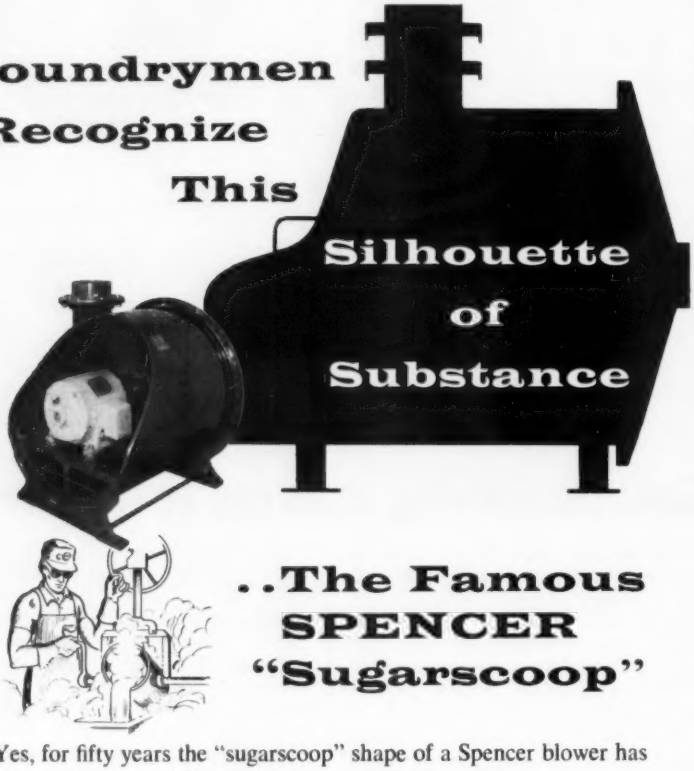
DIECASTINGS

The Diecasting Process, by H. K. Barton, published by Macmillan Co., 60 Fifth Ave., New York 11, N. Y. Price, $5.

This book is meant to be useful to anyone who makes, buys, sells, or uses diecastings. Accordingly it presents information covering aspects of diecasting of interest to each of those categories.

Chapters cover basic requirements of the process, diecastings, diecasting dies, diecasting machines, cleaning and machining operations, sur-

Foundrymen Recognize This Silhouette of Substance

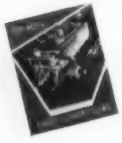


..The Famous SPENCER "Sugarscoop"

Yes, for fifty years the "sugarscoop" shape of a Spencer blower has been a reassuring sight familiar to foundrymen.

The simple, rugged design of Spencer blowers has become a symbol of dependable air delivery . . . minimum maintenance . . . utmost reliability in operation.

These vital advantages, plus accurate and instantaneous control, have made Spencer blowers — *for half a century* — first choice of leading cupola manufacturers and foundrymen.



Request Catalog 126-A containing complete specifications on Spencer blowers.

ALSO MANUFACTURERS OF PORTABLE VACUUM CLEANERS

The SPENCER TURBINE COMPANY HARTFORD 6, CONNECTICUT

face finishes, assembly and attachment methods, related production techniques, design, purchasing diecasting components, the diecasting plant, alloys, machining, polishing, chromium plating specifications, service conditions, imperfections, die steels, die specifications, and other pertinent subjects.

PRODUCTION PROCESSES

Manufacturing Processes — Production, **by S. E. Rusinoff, cloth, 560 pages, 5½ x 8½ in., published by the American Technical Society, Chicago. Price $7.25.**

This text, a second edition, is designed to acquaint the reader with the selection and use of machine tools and related equipment, latest production methods, and recent developments in safety engineering. It is intended for use in shop courses for undergraduate students and for use by shop foreman, plant supervisor, engineer, or executive.

RUSSIAN GLOSSARY

Russian-English Glossary of Optics and Spectroscopy, **edited by I. Emin, paper, 8½ x 11 in., 78 pages, published by Interlanguage Dictionaries, New York, N. Y. Price $10.**

Contains over 4000 terms and expressions in the fields of optics and spectroscopy which were gathered from numerous articles appearing in various Russian journals in those fields as well as in technical and experimental physics. Also includes many terms from original Russian texts, and in English texts which have been translated into Russian.

Electric Overhead Crane Institute Elects Officers

Arland R. Walkley, Manning, Maxwell & Moore Inc., Muskegon, Mich., was elected president of the Electric Overhead Crane Institute Inc., Washington, at the group's annual meeting. William H. Morgan, Morgan Engineering Co., Alliance, Ohio, was named vice president.

Directors elected include William W. Peattie, Northern Engineering Works, Detroit; John S. Jackson, Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.; Robert F. Rice, Whiting Corp., Harvey, Ill. Joe H. Peritz was re-elected executive secretary-treasurer, and C. M. Dinkins, general counsel.

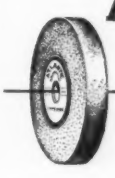
Ordnance Association Lists Casting Section Committee

American Ordnance Association has drawn up a steering committee of its Casting Section, Production Techniques Division. Stowell C. Wasson, vice president, National Malleable & Steel Castings Co., Cleveland, heads the committee as chairman. Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich., is deputy chairman, and W. M. Dalton, president, Dalton Foundries Inc., Warsaw, Ind., is secretary.

Other members include Ross L. Gilmore, president, Superior Steel & Malleable Casting Co., Benton Harbor, Mich.; Robert R. Miller, president, Precision Metalsmiths Inc., Cleveland; Guy Pitts, vice president, Bohn Aluminum & Brass Corp., Detroit; John L. Worrilow, secretary, Lebanon Steel Foundry, Lebanon, Pa.; and J. Don Zaiser, president, Ampco Metals Inc., Milwaukee.

ATLANTIC WHEELS

Fast, cool, clean-cutting Atlantic Grinding Wheels float right through the roughest flash and weld removal jobs . . . speed up grinding . . . give smoother surfaces with less pressure and fewer passes. Good reasons why you keep cutting costs down with Atlantic Wheels.

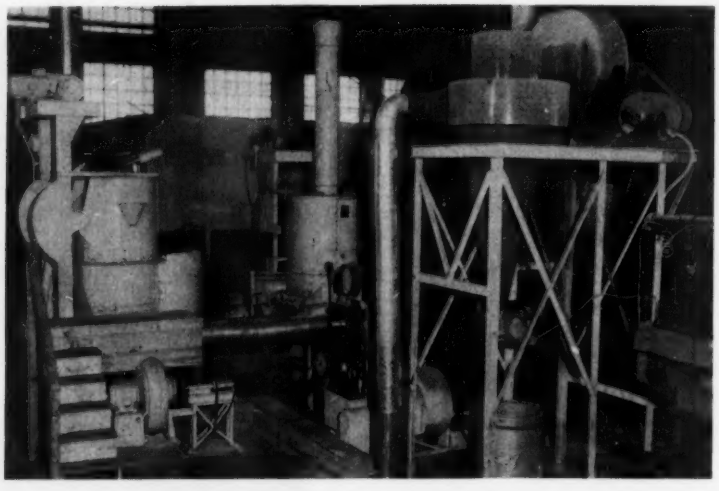


Atlantic Abrasive Corp.
A DIVISION OF ABRASIVE PRODUCTS, INC.
South Braintree 85, Massachusetts

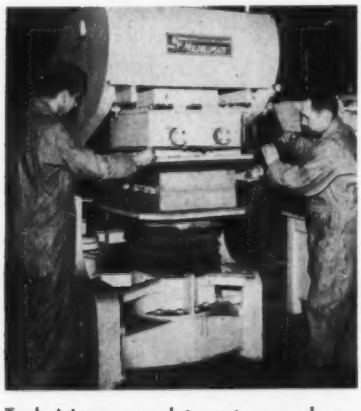
STRAIGHT WHEELS • CYLINDER WHEELS • CUP WHEELS
CONES • PLUGS • MOUNTED WHEELS AND POINTS

Circle 662 on Page 53

Bill Monro, director of the technical center, tests new pattern spray



Shell sand preparation unit used in co-operative projects with resin producers to develop new resins for shell molding and coremaking



Technicians complete setup work on a large mold blower as part of a study for a gray iron foundry

TECHNICAL CENTER

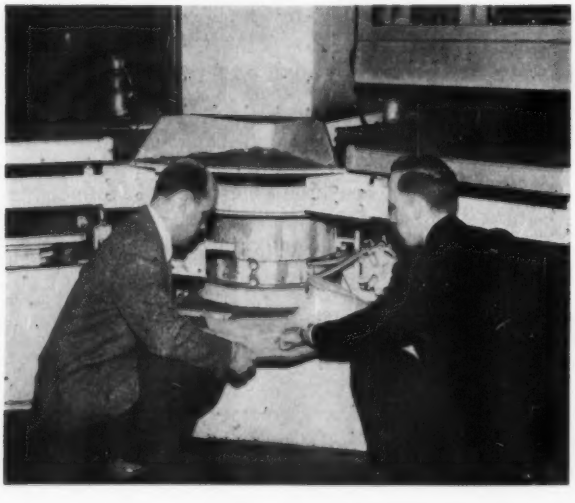
Tests New Developments

● MORE than 350 people took advantage of the opportunity to inpect the Technical Center of Beardsley & Piper Div., Pettibone Mulliken Corp., during the recent AFS Castings Congress in Chicago.

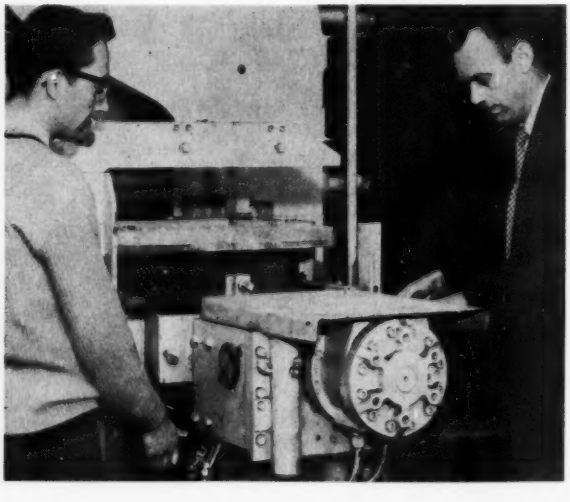
The center, situated at the Pettibone Mulliken foundry at 1401 North Cicero Ave., occupies about 8000 square feet of floor space. It is staffed by a technical director, William Monro, and four full-time technicians.

Activities at the center are concerned with these main functions: 1. Development of new and improved foundry equipment. 2. Assisting foundries in developing operating practices through adaptation of equipment to their requirements. 3. Testing of specific materials and development of new sand

Staff engineer (right) points out suggested changes in a customer's pattern being run on a shell molding machine



A high-production CO_2 core and mold blowing and gassing unit is part of equipment available at technical center



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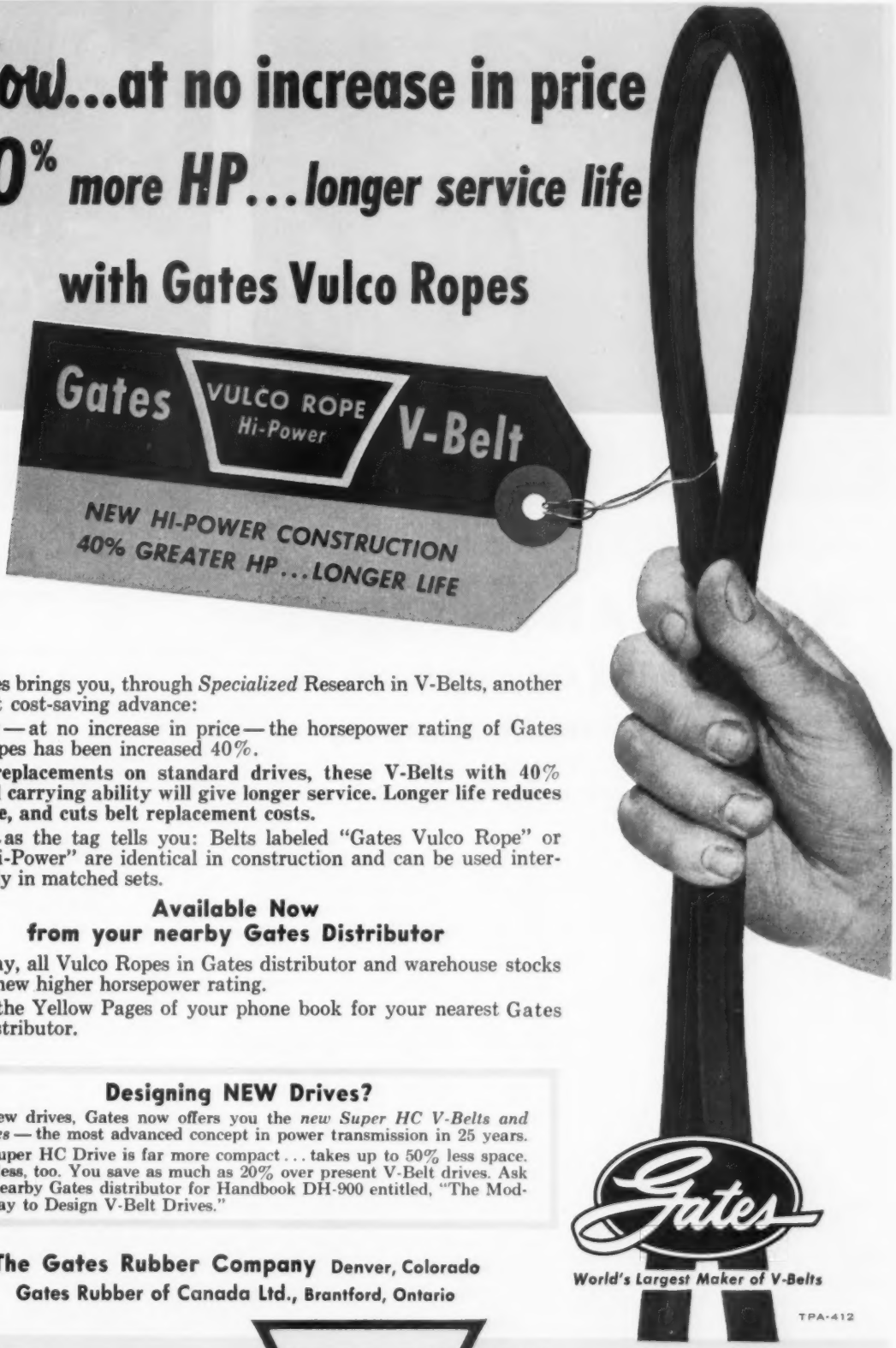
40% more HP...longer service life

with Gates Vulco Ropes



Gates brings you, through *Specialized* Research in V-Belts, another important cost-saving advance:

Now — at no increase in price — the horsepower rating of Gates Vulco Ropes has been increased 40%.

As replacements on standard drives, these V-Belts with 40% more load carrying ability will give longer service. Longer life reduces down-time, and cuts belt replacement costs.

And as the tag tells you: Belts labeled "Gates Vulco Rope" or "Gates Hi-Power" are identical in construction and can be used interchangeably in matched sets.

Available Now from your nearby Gates Distributor

Today, all Vulco Ropes in Gates distributor and warehouse stocks have the new higher horsepower rating.

See the Yellow Pages of your phone book for your nearest Gates V-Belt distributor.

Designing NEW Drives?

For new drives, Gates now offers you the *new Super HC V-Belts and Sheaves* — the most advanced concept in power transmission in 25 years. The Super HC Drive is far more compact . . . takes up to 50% less space. Costs less, too. You save as much as 20% over present V-Belt drives. Ask your nearby Gates distributor for Handbook DH-900 entitled, "The Modern Way to Design V-Belt Drives."

The Gates Rubber Company Denver, Colorado
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Gates
World's Largest Maker of V-Belts

TPA-412

Gates VULCO ROPE Hi-Power V-Belts

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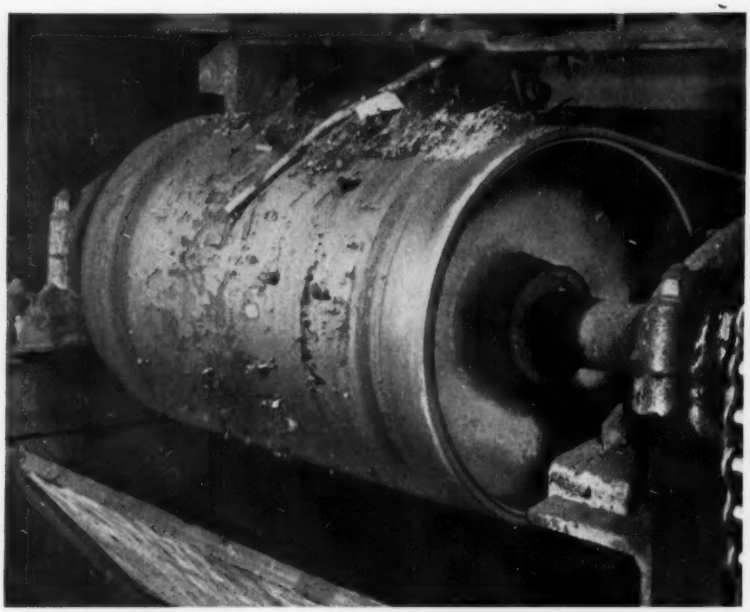

Stearns 12"x 24" Indox V Magnetic Pulley removes tramp iron from 105 tons of foundry sand daily at Continental Gin Company. Powerful magnetic field holds iron fragments as clean sand is discharged into skip hoist which feeds muller. A pioneer American manufacturer, Continental can trace its origins from 1836.

"NEVER ANY DOUBT"

with Stearns INDOX V Permanent Magnet Pulley

says Continental Gin Company

Continental Gin Company, Birmingham, Alabama, recently installed a Stearns Indox V permanent magnet pulley to replace an electromagnetic unit handling foundry sand. Immediate results were: (1) complete elimination of time-wasting maintenance on brushes, contacts, wiring, etc., and (2) assurance that the pulley is effective 100% of the time.

Says J. L. Hill, foundry superintendent, "Now when we use reclaimed sand, there's never any doubt. The Stearns Indox V magnetic pulley has eliminated all of the tramp iron. Power failures have no effect on pulley performance."

The new Stearns Indox V pulley is installed on a belt conveyor feeding a skip hoist to the muller. It handles 105 tons of sand daily, protects muller, sandslinger and pattern equipment from costly tramp iron damage. Estimated savings on equipment repairs are 50 percent for slinger parts and about 30 percent for mill linings. The pulley also protects foundry workers against hazards caused by iron fragments mixed with the sand.

Stearns Indox V magnetic pulleys outperform conventional permanent magnet pulleys, equal deep-field power of electromagnetic types. Radial pole design boosts holding efficiency and assures maximum tramp iron removal. Standard pulley widths and diameters to match your present conveyor system. Call your Stearns representative or write for Bulletin No. 1021G.

WHAT IS INDOX V?

Indox V is a highly oriented barium ferrite ceramic material. Its energy is comparable, on an equivalent weight basis, to that of Alnico V — the most powerful permanent magnet material available. Indox V magnets possess unique advantages — light weight, high electrical resistivity, great resistance to demagnetization, inexpensive, non-critical raw materials — plus an energy product over three times that of non-oriented ceramic magnets. Indox V is used in magnetic pulleys manufactured by Stearns exclusively.

STEARNS MAGNETIC PRODUCTS

A DIVISION OF THE INDIANA STEEL PRODUCTS COMPANY

635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

Technician checks out a new binder in a laboratory-type muller which is one of eight mulling units available for the center's evaluation projects

binders and sand formuluations in co-operation with suppliers.

Equipment valued at more than $250,000 is available for test and evaluation projects. It includes a complete shell molding and shell coremaking laboratory. A shell sand preparation unit has been used by virtually every major resin producer in development work on new resins. Eight mullers are employed in the evaluation of various conventional and shell sand additives and mixtures.

Gray Iron Founders Publish Directory and Buyers Guide

Gray Iron Founders' Society, National City-East Sixth Bldg., Cleveland 14, has published a "Directory and Buyers Guide" covering manufacturers of gray iron castings. The 75-page book includes an alphabetical list of members of the society, a geographical listing of members, and a buyers guide section.

The directory section lists firm name and address, names of important personnel, types and sizes of castings produced, capacity, and special facilities.

The buyers guide portion includes 140 different classes of the most common castings. Copies are available on letterhead requests.

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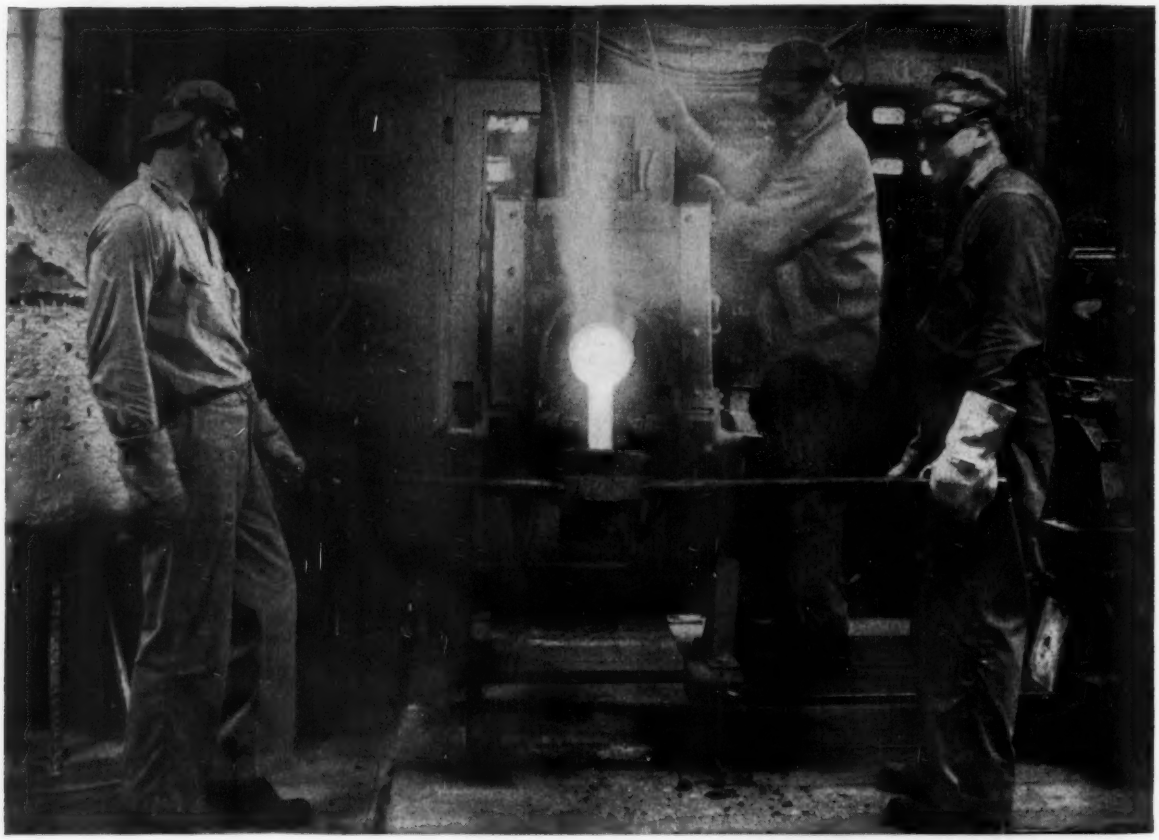

Photo courtesy Arwood Precision Casting Corporation.

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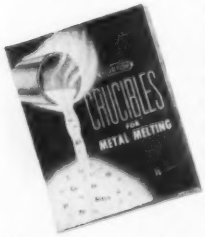
You can pick the exact type of crucible you need for precision casting of high alloy steels from the wide NORTON line and have excellent protection against contamination.

No other crucibles give you such high stability to both heat and chemical action under a wide range of operating conditions. What's more, their fine, smooth surfaces are invaluable wherever molten metal must be kept free of refractory inclusions.

Specifically engineered for use in induction-type and indirect arc furnaces, these rugged NORTON Crucibles are ideal aids to critical casting techniques where both high precision and purity of the molded part are essential.

NORTON Crucibles can increase the precision, efficiency and economy of your casting operations. They're available in a wide variety of sizes. Get full details from your NORTON representative. And write for this new informative catalog on the *complete* line of NORTON Crucibles. NORTON COMPANY, Refractories Division, 306 New Bond Street, Worcester 6, Massachusetts.



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MAGNORITE* K Crucibles (97% Fused Magnesia)
Widely used for melting steels and ferrous alloys as well as cobalt, chrome, copper, bronzes and nickel.

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Designed to meet refractory requirements calling for low boron, iron oxide, and silica content.

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Provide outstanding stability in both oxidizing and reducing atmospheres. Ideal for vacuum melting.

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For operations where extremely high refractoriness and low thermal conductivity are required.

CRYSTOLON* Silicon Carbide Crucibles and other types of crucibles also available for melting nonferrous metals and alloys.

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Trouble Shooting

By C. W. AMMEN

How To Cut Metal Losses

Dear Charlie:

It is common practice with us to allow 10 per cent for melt loss. We find in most instances, however, that the loss is less, for a given amount of charged metal, when the sprue, gates, etc., from a heat are weighed back. On the other hand, when we take inventory, we are amazed to find that we are in bad shape as to metal loss. The figure runs all over the place. As a result, I am afraid that on some jobs we do not realize the profit we figured on. How about it? Where do you set the metal loss figure when estimating a job?

Sincerely,
Sam

Dear Sam:

High metal losses are the product of sloppy operations and unrealistic figures.

Much has been written about melt losses and their control and about oxidation, vaporization, and the combination of the two. The best of melters have been called on the carpet and chewed out when inventory was taken.

Even when metal was at an all-time high price, I saw some very sloppy operations. Taking of the metal inventory itself was careless and inaccurate. Your metal loss probably is due to a great number of things other than melting.

Dirt floors of some shops are regular mines, 2 ft thick, with several tons of metal in the form of filings, splatters, and castings. The dump out back in many instances would show a high figure if assayed for metal—old crucibles with skulls, old cores with the vents full of metal, and old molding sand chockful of riddlings, castings, and fines. The heap inside often carries a high percentage of tramp metal and castings, too.

When the area under and around the furnaces is cleaned, is it picked for metal or is everything put on the dump? When you reline a furnace, how much metal leaves for the dump with the bricks and refractories? Ill-fitting core prints often lead to high metal loss through finning and flash. So does poor molding. The pouroff operation can cost you several dollars per day in spills, bobbles, etc. Improperly cut and located pouring basins can do the same.

How much brass is hidden in corners, etc.? In the cutoff operation, are the abrasive wheels too thick? Are gates cut off close to the castings, or are big nubs left to be ground away? What is done with metal grindings? How much is actually collected and sold compared with what is generated? Do you overgate and riser? What happens to the needles from venting? On the shakeout, how much metal is recovered, and how much makes the dump? Does your slag run high in metal?

Are you wasting a couple of bucks a day in phosphor copper? You might be. A good many shops still use the grab-and-throw method, and for the most part the grabber and thrower doesn't have the slightest idea how much he grabs and how much a pound it costs.

Is the metal you charge really clean? I have seen batches on the scale weighed up, ready to charge, with the weight entered on the melt sheet, containing a high percentage of sand or nonmetallic junk. This practice provides an accurate figure, doesn't it? It also helps you produce good clean castings, of course.

Do you properly drum and classify what you sell to the smelter? Skimmings often can be made to give up a good quantity of big chunks by cracking. Of course, your slag should be clean. Check to see how much per ton you are receiving from the smelter for your slag. Assay your slag. I have seen skimmings and slag from a brass shop run as high as 10 per cent copper on recovery.

I can go on and on and move from department to department. As you know, aside from regular melting practice, there are many other places where metal can be lost. The thing to do is to assign one person to spend a month of survey and make up a written report as to his findings and recommendations. If there is a leak in the basket, or several leaks, you must run them down, plug them up, and keep them plugged.

In some instances you will find that loss at each given point is small, but that the total amounts to considerable money. If an operation is not exceptionally clean, one man ramrodding all day on loss control can save you his wages plus a profit.

The difference between profit and loss lies in knowing your correct costs. Unless you really know them, unless your figures are accurate and your management sound, you are in danger of going down the drain. And even though you show a profit, you might be able to make a bigger one, too.

Of course there is a point of diminishing return. This you must find for yourself. Don't spend $5 to recover $2 worth of metal. Best of all, don't lose the $2 in the first place.

Sincerely,
Charlie

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True! Keokuk Silvery saves time and money . . . is quick to unload, easy to handle, melts smooth and uniform always. Same goes for other Keokuk alloys. See how—send for booklet "For Lower Costs, Higher Quality Products." It shows where savings begin.
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The Keokuk trio has a way of beating costs. While the Chief plants a dime in the turnstile, Junior and Princess Wenatchee go through gratis.

Limitations Exist on the Application of Sales Tax

Extent of Engineering Skill Involved a Factor

By Albert W. Gray

● SUIT was brought several years ago by an Illinois steel foundry for the recovery of sales taxes which, it contended, had been wrongfully imposed on its sales of castings.

Under the laws of that state a tax is imposed on persons engaged in the selling of personal property at retail. Definition of a "sale at retail" is any transfer of ownership to a purchaser for consumption but not for resale.

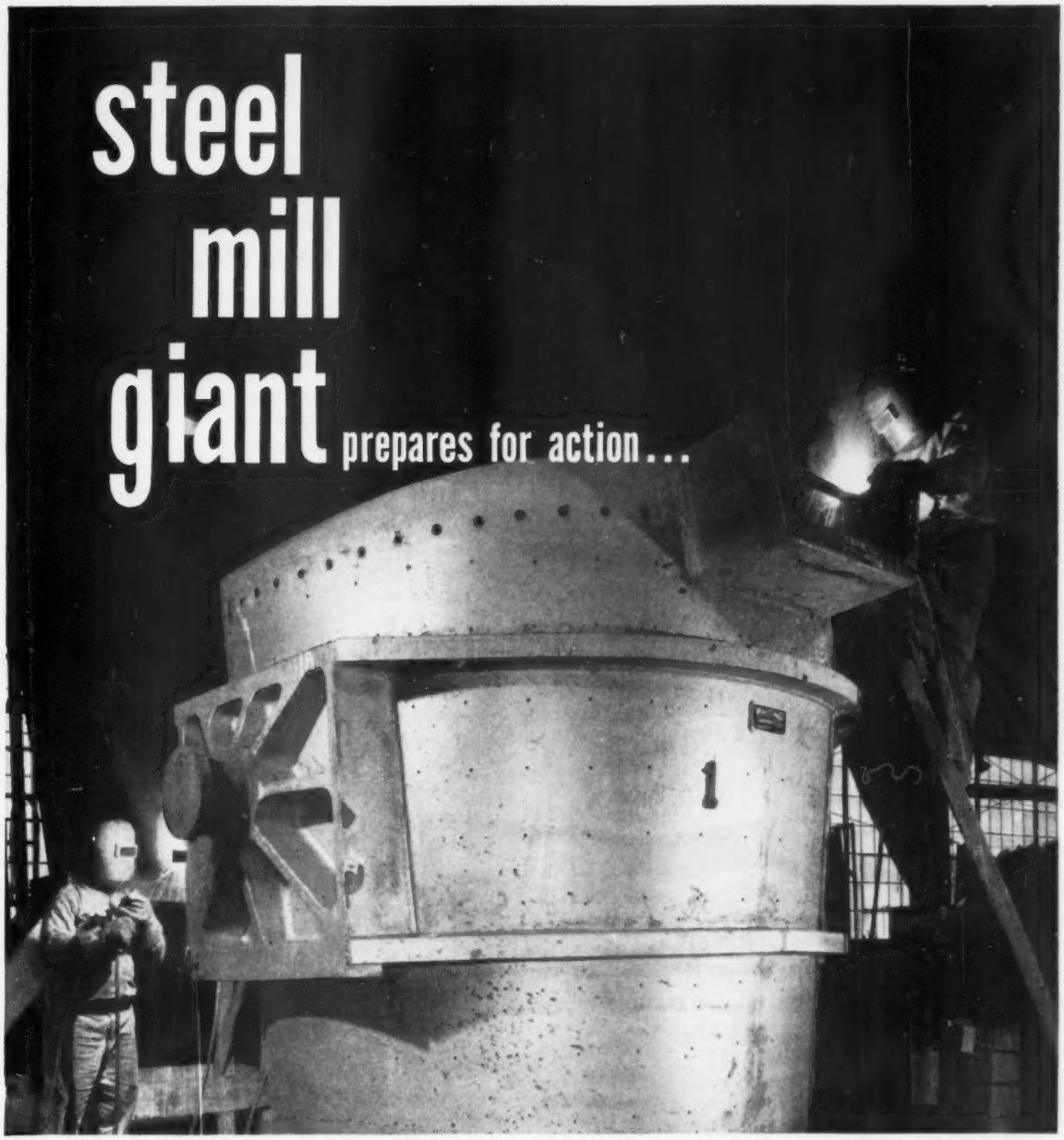
In the manufacture of these castings some were standard products. Others, however, were made up on special orders, and the action brought here was for a recovery of the taxes paid on these special castings. When the company's bid for the delivery of these castings was accepted, the patterns to be used in the production were supplied by the customer.

It was contended by the taxpayer in this action that the castings were manufactured on special order, produced through technical engineering skill and had no commercial value other than for the purpose for which they had been ordered by the customer. Further, that the activities of the taxpayer were not sales but services. The Department of Revenue, on the other hand, insisted that the company was not engaged in the exercise of engineering skill but merely in the manufacture and sale of castings that were tangible personal property subject to this sales tax.

Selling or Servicing—Refusing to grant the manufacturer this refund, the Supreme Court of that state said, "because the tax is imposed upon those who are engaged in the business of selling tangible personal property at retail, questions calling for a characterization of the taxpayer's business have frequently arisen.

"To be taxable the business of the taxpayer must be that of selling tangible personal property rather than of rendering services. Where business is that of rendering services, to which a sale at retail is in-

steel mill giant prepares for action...



Preparations are nearly complete . . . and soon this giant 60-ton ladle, built to A.I.S.E. specs, will be pouring out profit for another satisfied Whiting customer. Cast steel trunion bases, forged steel trunions, and adjustable swivel-type bottom tapping lever guarantee low maintenance . . . easy control . . . long, rugged service life. When you need ladles—capacities from 100 lbs. to 200 tons—specify Whiting!

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cidental, the occupation has been held not taxable. As has been pointed out, the facts and situations in each case are different, making it difficult to apply in the way of a general group."

The feature disclosed in this and an earlier decision suggests, however, that in many instances producers, such as foundries, might be freed from the imposition of taxes of this character were they aware of the limitations on that liability.

Refusing in this instance to permit a recovery of the taxes by the manufacturer, the court added, "Taxability is not ultimately determined by what the customer does with the article or whether or not it can be reused or resold. Those considerations are relevant only as they shed light on the primary occupation of the seller. If the article sold is the substance of the transaction and the service rendered is merely incidental to and an inseparable part of the transfer to the purchaser of the article sold, then the seller is engaged in the business of selling at retail."

No Tax on Skill—These circumstances were contrasted by the court with those in a similar incident before that same court a few years earlier. A milling machine manufacturer had been given an order for a machine for milling the bearing supports of industrial motors. The device was equipped with a special carriage for positioning the work and a special milling head to advance the cutters into the block, but the machine had no commercial value for any other purpose.

Here the court had held that the manufacturer was entitled to a refund of the sales taxes that had been paid on this contract. "We are of the opinion," said the court, "that the primary occupation of the taxpayer is that of furnishing a specially constructed machine on order, produced through the technical engineering skill of the manufacturer for the purpose of doing a special job, and not merely a sale of tangible personal property.

"In the ordering, engineering, manufacturing, and selling of the particular machine, the situation is somewhat analogous to that of a purchaser ordering from a contractor a house or building to be constructed upon certain lines on a particular design, to do a special thing for the purchaser. The occupation of a contractor is the rendering of a service of skill and is not subject to the tax."

Hearing Conservation Is Subject of New Booklet

Employers Mutuals of Wausau has published a booklet on industrial hearing conservation entitled "Guide for Industrial Audiometric Technicians," revised from one first printed in 1954. Particular emphasis is placed on the fine points of hearing measurement technique and on actual practice with the audiometer. Included is a brief background on the physics of sound and anatomy and physiology of the ear.

Intended purpose of the guide is to enable the industrial audiometric technician, under supervision of an otologist, to administer expert hearing measurement techniques and to obtain accurate threshold audiograms of unquestioned validity.

Although published primarily for Employers Mutuals policyholders, single copies are available free to those requesting the guide on their business letterhead. Address: Publications Editor, Accident Prevention Department, Employers Mutuals of Wausau, Wausau, Wis.

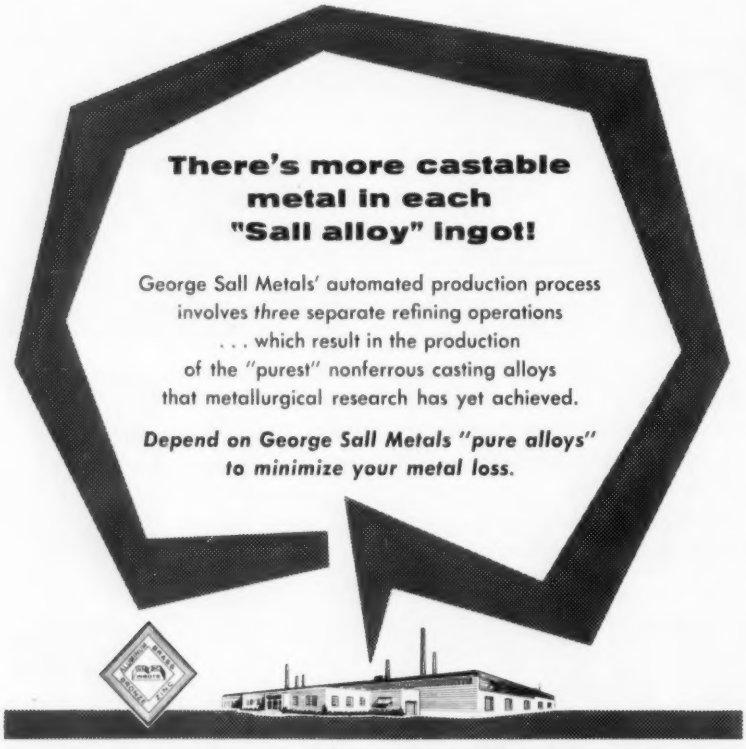
Malleable Founders' Safety Contest Winners Announced

Winners have been announced by the Malleable Founders' Society in its annual safety contest. Foundries which showed the largest percentage decreases in their accident frequency rates for the various size groups are as follows:

Dalton Foundries Inc., Warsaw, Ind.; Northern Malleable Iron Co., St. Paul; Erie Malleable Iron Co., Erie, Pa.; Central Foundry Div., General Motors Corp., Saginaw, Mich.

Wilmington Malleable Iron Works, Wilmington, Del., received a special award for its second straight year with no lost-time accidents.

Society members have reduced their accident frequency rate 41 per cent since this yearly competition was started in 1951.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George Sall Metals' automated production process involves three separate refining operations . . . which result in the production of the "purest" nonferrous casting alloys that metallurgical research has yet achieved.
Depend on George Sall Metals "pure alloys" to minimize your metal loss.

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PRODUCERS OF: Aluminum alloy ingot, Brass and bronze ingot, Zinc base die casting alloys

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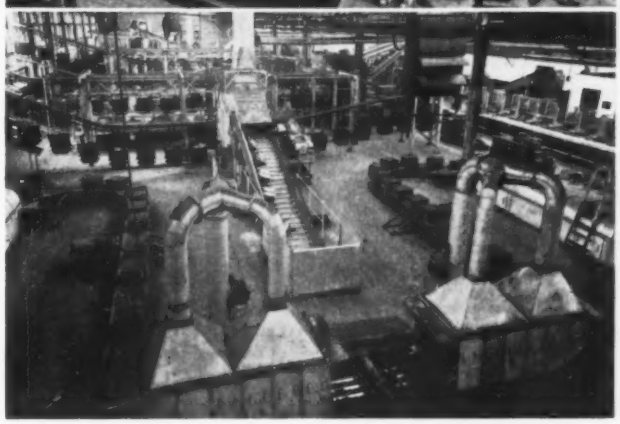

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Strong, safe and clean; engineered for long life, giving high load capacity and peak production.

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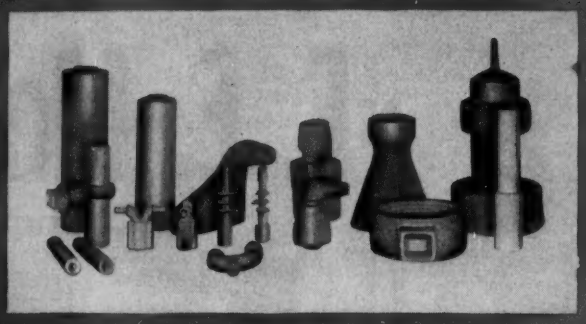
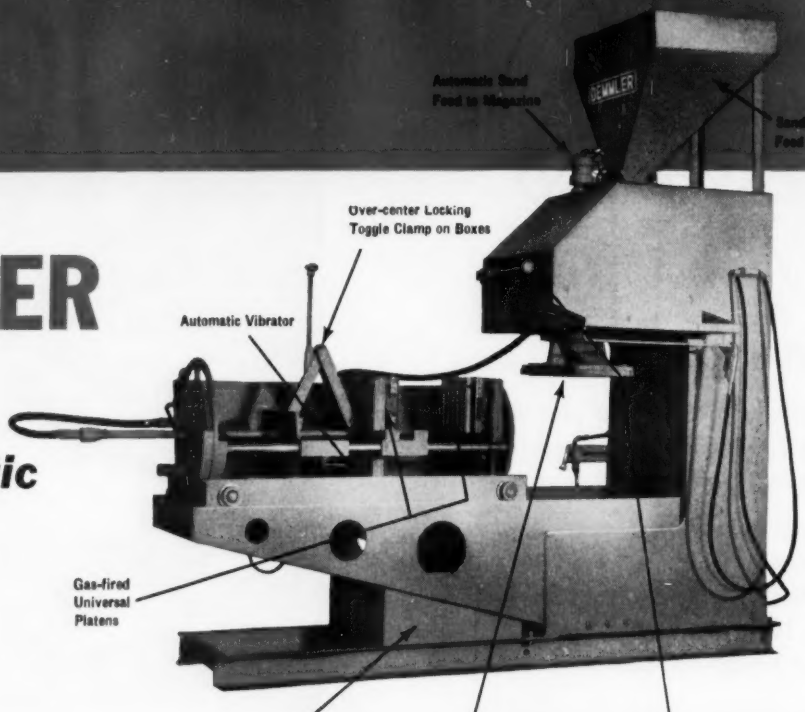
NOW—a low cost true shell core blower of rugged Demmler quality for only $1995.00... shipping wt. 1500 lbs.



Typical cores suitable for production on the "Utility" shell core blower.



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Semi-Automatic

Shell Core Blowers

OPERATING FEATURES:

1. Sand fed automatically from feed hopper into blow magazine. Hopper can be replenished without stopping production.
2. Over-center toggle lock for positive box closing and opening.
3. Master control lever shuttles box under blow head, clamps it, blows, unclamps and shuttles box to rollover drain position.
4. Rollover designed so that weight of boxes remain within the radius of rotation . . . no out of balance weight to struggle with.
5. Vibration applied to boxes automatically in rolled-over drain position for consistency of core wall thickness.

MODEL # 121015—VRD

Max. Box Size	12"x 10" x 15" Deep
Max. Core Weight, before draining	20 lbs.
Sand Feed Hopper Capacity	250 lbs.
Price, FOB Kewanee, Illinois	*$1995.00

*Price includes quality blow-off gun and spray gun.

MODEL # 242030—VRD

Max. Box Size	24" x 20" x 30" Deep
Max. Core Weight, before draining	80 lbs.
Sand Feed Hopper Capacity	1000 lbs.
Price, FOB Kewanee, Illinois	*$4990.00

*Price includes quality blow-off gun and spray gun.

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Demmler is by-far your best source for precision core box vents, manufactured by specialists who pioneered in the core blower industry. Many sizes, slot widths and screen meshes are available in brass and steel core box vents.

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A new general purpose vent which practically eliminates the cleaning coarser screens demand. Write for literature on Demmler vents.

A F S Congress

TECHNICAL REPORTS

These resumes conclude reports on technical sessions at the 1959 AFS Congress. Reports on Light Metals, Malleable Iron, Patterns, Brass and Bronze, Engineering and Costs, Foundry Management, and Safety and Hygiene appeared in the May issue beginning on p. 181

GRAY IRON

● TWELVE papers were included in the program sponsored at four sessions by the Gray Iron Division. In addition, this group joined with the Ductile Iron Division in a roundtable luncheon meeting.

Continuous Carbon Injection by J. E. Wilson and R. C. Schnay, Canada Iron Foundries Ltd., Montreal, Que., Canada. Presented by Mr. Wilson. Work was conducted to develop a reliable and controllable procedure for introducing carbon to cupola iron. The procedure evolved employs a graphite lance through which electric furnace graphite particles are injected by nitrogen at 1 psi below the surface of the iron in the cupola well.

Results indicate that the lance should be inserted into the metal at a 45-degree angle for longest lance life and best carbon pickup. This is at the rate of 82-85 per cent. Carbon content of the metal during the tests was held between 3.65 and 3.80 per cent. Factors affecting carbon control are feed rate of the graphite particles and immersion depth of the lance. Fluctuation in metal temperature has little effect.

The process has an inoculation effect, raising the strength of the iron. Also the pig iron constituent of the metal charge can be reduced, and more scrap used.

In discussion it was pointed out that the process makes possible reduced cupola operating cost and the production of iron of several analyses from a continuous-pour cupola.

Quantitative Measurement of the Effects of Pearlite and Graphite on the Machinability of Cast Iron by W. W. Moore, Battelle Memorial Institute, Columbus, Ohio, and J. O. Lord, Ohio State University, Columbus. Presented by Mr. Moore. Test conditions were set up to mini-

mize the effects on machinability of an as-cast surface and the presence of massive carbides and steadite. Study was directed at the effects of the relative volumes of pearlite in the matrix, graphite in the iron, and the size of graphite flakes.

Standard ASTM bars 1.2 in. in diam of ASTM A-48, Classes 20 and 30 gray iron were cast in green sand. They were machined to 1-in. diam prior to subjecting them to a constant-pressure lathe test. Results show that machinability rating is increased by a decrease in the relative volume of pearlite, an increase in the relative volume of graphite, and, to a lesser extent, by an increase in the relative size of graphite flakes.

Findings of this study are consistent with the common understanding that machinability generally is improved in any metal by reducing its strength, ductility, or coefficient of friction with the cutting tool.

Significance of Reported Chemical Analysis of Cast Iron by D. E. Krause, Gray Iron Research Institute, Columbus, Ohio. Chemical analyses of numerous cast iron samples by several laboratories over a period of years show that accuracy and reproducibility limits are greater than commonly assumed. Furthermore, analyses may be precisely reproducible with consistently inaccurate results.

Greater accuracy of analysis is obtained by submitting samples of that same iron to at least six laboratories. The range of results will be about three times greater than that obtained by one laboratory. Because this broad range exists, it must be recognized when the relationship of cast iron chemical composition to its mechanical and physical properties is evaluated.

Causes of some of these variations in accuracy were explained and remedies suggested.

Martensitic White Irons for Abrasion Resistant Castings by T. E. Norman, Climax Molybdenum Co., Denver, and D. V. Doane and A. Soloman, Climax Molybdenum Co., Detroit. Presented by Mr. Doane. Two types of martensitic white irons were described. They contain either type C_1 or C_2 carbides plus austenite or one of its low-temperature transformation products. Both types have better abrasion resistance than pearlitic white irons, the one with type C_2 carbides showing greater resistance. Both are stronger and tougher, the type C_2 showing the best values.

The alloying elements of molybdenum, manganese, nickel, copper, and chromium are effective in retarding pearlite formation, whereas carbon and silicon accelerate pearlite formation. Chill casting was shown to improve mechanical properties and to suppress formation of pearlite.

Also, arrested cooling in the range of 1400-2000° F is effective in suppressing pearlite. Furthermore, the white irons with type C_2 carbides respond well to reheat treatments for the formation of martensite. It also was determined that the quantity and composition of retained austenite influence mechanical properties and abrasion resistance.

Balanced compositions for developing optimum properties in martensitic white irons were discussed.

Effect of Molybdenum on Elevated Temperature Properties of Gray Iron by G. K. Turnbull and J. F. Wallace, Case Institute of Technology, Cleveland. Presented by Mr. Turnbull. Molybdenum additions up to about 1.5 per cent produce considerable and consistent improvement in short-time tensile strength of 3.8 per cent carbon equivalent gray iron at room temperature, 800, 1000, and 1200° F. Although strength values decrease at increasing temperatures, they are better at any given temperature than strengths of unalloyed iron.

Stress-rupture properties to a fracture time of 100 hr at 800, 1000, and 1200° F also are improved by molydenum additions to 2.0 per cent. The amount of strength increase for each increment of molybdenum decreases as temperature is raised.

Stress-rupture properties of the base iron with about 0.60 per cent chromium added are higher at 1200° F for all molybdenum contents. Superior short-time tensile and stress-rupture properties at 800 and 1000° F are obtained with this chromium addition for molybdenum contents to 1.4 per cent. At higher molybdenum contents, however, the straight molybdenum irons show higher strength.

In all the irons, stress-rupture strength decreases uniformly with increasing time of testing to 100 hr. Strength decreases more rapidly with increasing time at higher testing temperatures.

"It's the deepest pit mold we ever made"

Ductility and Strength of High-Carbon Gray Iron by E. M. Stein and H. O. McIntyre, Battele Memorial Institute, Columbus, Ohio. Presented by Mr. Stein. Ductility decreases as manganese content of gray iron exceeds 0.5 per cent. Also, increasing the carbon or silicon contents does not increase ductility. However, ductility can be increased significantly by inoculation if manganese content is held below 0.6 per cent.

The work also showed that increasing the carbon equivalent from 4.0 to 4.5 per cent decreases tensile strength of irons from about 25,000 psi to 10,000 psi. Manganese additions above 0.5 per cent produce higher tensile strengths so long as they increase proportions of pearlite in the matrix. Tensile strength is not influenced by inoculation except through the normal effect of the increased silicon content.

Reasonably close correlation was found between hardness and strength in all gray irons tested.

Foundries Can Produce Their Own Cast Iron Directly from Ore

GR BUNG

OLIVE HILL SIDEWALL

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GREFCO BRICK WITHSTAND THE TOUGHEST CONDITIONS IN MALLEABLE FURNACES . . .

General Refractories offers two outstanding Fireclay brick expressly produced for the severe service conditions characteristic of malleable iron furnaces:

Grefco's GR BUNG BRICK offers superior resistance to thermal spalling and to elevated temperatures. These qualities make it the brick of choice for malleable furnace roofs.

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Grefco GR BUNG BRICK and Grefco OLIVE HILL SIDEWALL are two of the dozens of specially-formulated refractories which Grefco offers to American industry. Whatever your refractory requirements, General Refractories can meet them BEST.

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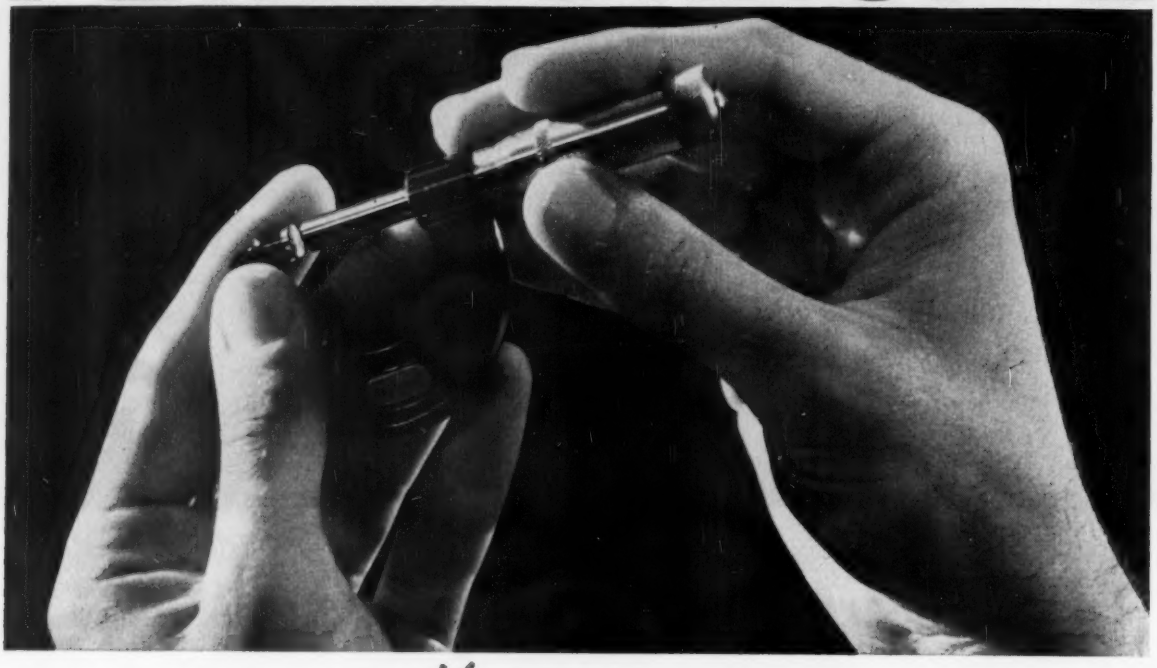

how precise can *You* be in your blast cleaning room?

Blast cleaning is admittedly a job of many variables, hard to keep on an even keel. Involved in economical blast cleaning are such things as good housekeeping, good control over equipment and, of course, good shot and grit. Many blast cleaning troubles develop, because the characteristics of many abrasives vary with each shipment!

NATIONAL has developed its ability to give you abrasives with controlled characteristics ton after ton after ton. This eliminates the *one* variable over which you have no control and makes possible staggering savings. Cost-conscious customers have enjoyed this NATIONAL advantage for over a decade!

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by H. W. Lownie Jr. and A. J. Stone, Battelle Memorial Institute, Columbus, Ohio. Presented by Mr. Stone. High cost of providing additional blast furnace capacity and the diminishing supply of good coking coal are attracting attention to the numerous processes in use and under development for the direct reduction of iron ore to metal.

Depending on tonnage requirements, some of these processes could be adapted to foundry use. It is estimated that the cost of cupola iron at the spout ranges from $50 to $110 a ton, varying with size of foundry and its operating practice. Average cost is about $58. A direct-reduction unit with 400 tons daily capacity would cost about $6 million and could produce iron at $47 a ton. A 100-ton unit costing $2.5 million could make iron at $61.50 a ton.

Utilization of Radioisotopes in the Foundry Industry by M. Pobereskin and D. N. Sunderman, Battelle Memorial Institute. Presented by Mr. Sunderman. Applications of radioisotopes in the metalworking industry are growing. Wear of firebrick in furnace lining can be checked by insertion of a pellet in the brick. Wear to a point where the pellet drops out is indicated by the change in radiation.

Other applications include measurement of vapor pressure of metals, rate of diffusion of ferrochrome, study of absorption of sulfur from fuel by metal in an open-hearth furnace, corrosion studies, thickness gaging, and investigation of contaminant sources in melting furnaces.

AWS-AFS Committee Report on Welding Iron Castings. Gray Iron by Donald Kuhn, Chapman Valve Mfg. Co., Indian Orchard, Mass. Literature survey has been completed. Test results with both electric arc and gas welding show wide variations despite standard procedures employed. J. E. Fitzwater, International Harvester Co., Chicago, reporting on Ductile Iron, indicated that gas-welded coupons showed better consistency than in the previous series of tests. This was not true of the arc welding tests.

Malleable Iron tests were reported by S. T. Walter, Air Reduction Sales Co., New York. Results generally were not regarded as successful; brazing probably must continue to represent the preferred joining method.

According to James S. Vanick, International Nickel Co., New York, improved welding practice on test castings has been achieved in the latest series of tests, and procedures will be checked in an attempt to develop further improvement.

Factors Influencing the Soundness of Gray Iron Castings by I. C. H. Hughes, K. E. L. Nicholas, A. G. Fuller, and T. J. Szajda, British Cast Iron Research Association, Birmingham, England. Presented by Mr. Hughes.

The constitution of nearly all gray irons leads to both contraction and expansion stages during their solidification, and to a large extent soundness depends on the detailed way in which these volume changes act. In many castings, expansion during solidification is associated with the formation of shrinkage defects. Casting expansion is promoted by mold cavity volume changes, which are more pronounced in softer molds and are dependent on pouring temperature and molding sand type and properties.

Major composition of the iron also affects casting expansion and soundness by influencing the amount of eutectic graphite. Phosphorus leads to soundness problems because of the presence of a low-melting-point phase. Increasing the degree of nucleation of the graphite eutectic leads to unsoundness. This is a common foundry variable which can be measured and is subject to some control.

Effect of Mold Materials on Cooling Rate and Physical Properties of Cast Metals—Report of Subcommittee T.S. 46, Institute of British Foundrymen, by John Hird, chairman, Birmingham, England.

The present investigation, part of a program which started ten years ago, resulted in these main conclusions:

1. Tensile strength of an iron is influenced by the mold materials, being highest when the mold material is coarse grained and rammed hard and lowest when the material is fine grained and rammed soft.

2. Influence of the mold on tensile strength is due to the mold material or mold density or both affecting the cooling rate of the molten metal.

3. Maximum change in tensile strength brought about by the widest range in sand mold material and mold density studied is approximately 20 per cent. The figure is from one-half to one-third that which could be expected by a change in section size (bar diameter) from 1¼-in. to ½-in. diameter.

4. Results of the tests using cast test bars are confirmed by the results from test bars machined from step castings made under commercial conditions in four foundries using iron with widely different carbon equivalent values.

Copper in Cast Iron by Albert deSy, University of Ghent, Ghent, Belgium. Copper acts as an austenite stabilizer, promotes pearlite formation, and is a powerful hardener of the ferrite phase. It is a mild graphitizer, one-third to one-fifth that of silicon. It prevents chilling in thin sections. Influences on physical properties are contradictory, although tensile strength rises with copper contents up to 3 per cent, and hardness increases.

HEAT TRANSFER

● THE HEAT TRANSFER program consisted of two sessions. Topics discussed included oil quenching, solidification times in sand molds, and casting design.

Design of Castings—Panel discussion by J. G. Henzel Jr., General Electric Co., Schenectady, N. Y., chairman; R. W. Ruddle, Foundry Services Inc., Columbus, Ohio, co-chairman; D. J. Albanese, National Malleable & Steel Castings Co.,

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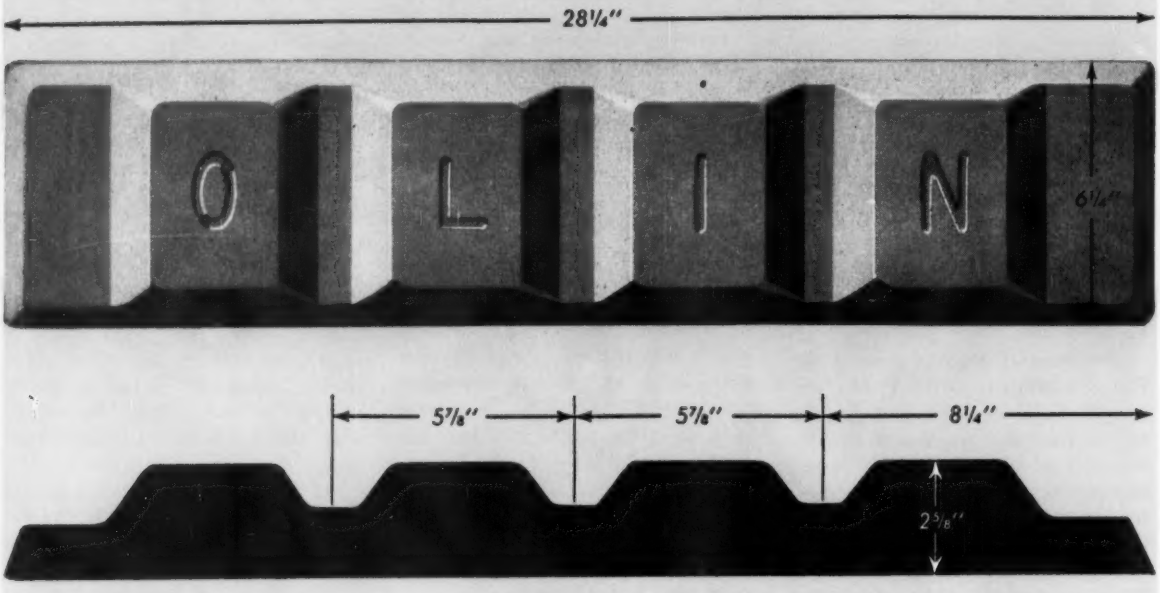

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Cleveland; A. Bain, Canada Iron Foundries Ltd., Trois Rivieres, Que., Canada; J. L. Flitz, Central Foundry Div., General Motors Corp., Saginaw, Mich.; E. S. Frens, General Electric Co., Schenectady; and J. F. Wallace, Case Institute of Technology, Cleveland.

Cochairman Ruddle opened the session by noting that heat transfer is important to design because of its relationship to production of a castable, functional part at the lowest cost. Poor design creates potential hot spots which can lead to shrinkage. When such hot spots can't be avoided, blind risers or chills may solve the problem. The designer must know enough about heat transfer to avoid problems of this nature or to minimize their seriousness.

Mr. Ruddle further pointed out that hot tearing can result from stresses caused by freezing differentials which good design can avoid. Designers also should be aware that thin sections tend to possess greater tensile strength than thick ones in many alloys, and they should design so that heat is dissipated evenly during quenching. Another relationship of heat transfer to design includes the fact that alloys freeze differently and thus vary in their susceptibility to shrinkage and hot tearing.

The remainder of the session was devoted to a question-and-answer period in which a variety of problems was considered. These points were brought out:

Tapering is not as important in nodular iron as in steel because the feeding distance of nodular iron is shorter. In dry sand molds, risers may not even be necessary. Nodular iron has a soft, mushy solidification. With both nodular and gray irons, in vertically poured molds with no obstructions to the bottom, popgates can be used to eliminate the need for taper. This technique requires extremely fast pouring and strict pouring temperature control.

All things being equal, pouring temperature probably has little effect on feeding distance in steel. If the mold is so small that it can be filled almost instantaneously, high pouring temperature may decrease viscosity enough to increase fluidity and feeding distance.

Chills can be used to increase the feeding distance of nodular iron, but there is little information as to the degree of chill needed. Indirect chills might help to produce a slow, steady, chilling effect.

Modern Quenching Oils and Techniques for Foundry Heat Treatment by N. F. Squire, Aldridge Industrial Oils Inc., Cleveland. This paper discussed the increasing importance of the quenching phase of heat treating of steels and the variables affecting it. Dealt with were the conventional quench, marquench, and modified marquench. Case histories were presented to show results of using an additive-type quenching oil medium.

The benefits to be obtained by good quenching techniques were summarized as follows: 1. Economical service life of the quenching medium. 2. Uniform hardness. 3. Elimination of undesirable transformation structures. 4. Development of optimum quenching conditions for steels of small or varying grain sizes, different hardenabilities and variable cross sections. 5. Minimum dimensional changes. 6. Elimination of quenching cracks.

Contacts with heat treating departments throughout the country show that many are not taking advantage of improvements in equipment and quenching oils now available. In most instances, personnel responsible for heat treating recognize the benefits that can be obtained, but other branches of management that control appropriations are not familiar with heat treating or aware that heat treating has become a precision operation.

Case histories show how improvements in equipment or adoption of a more efficient quenching oil has eliminated reruns and scrap in heat treating, reduced distortion and subsequent straightening costs, or permitted closer preliminary machining, which reduced final grinding.

Solidification Times of Simple Shaped Castings in Sand Molds by J. T. Berry, Armour Research Foundation, Chicago; G. Martin, Industrial Research Laboratories, Honolulu Oil Corp., Los Angeles; and V. Kondic, University of Birmingham, Birmingham, England.

Purpose of this highly technical investigation was to analyze the fundamental relationship between molding materials, metal, and metal solidification. The approach was a mathematical one. One of the difficulties is that sand is not a homogeneous material. The research sought to determine the effect of different molding materials and the effect of casting shape on metal solidification.

EDUCATION

● THE Education Division program consisted of only one session, but it attracted an overflow audience, part of which stood during the meeting. Shell molding was the magnet which attracted the crowd.

New Skills Required for the Shell Process by H. C. Grant, Ford Motor Co., Dearborn, Mich. Ford Motor Co. is turning increasingly to the shell molding process. Of the company's three foundries, the Dearborn Specialty Foundry is doing shell work entirely, and the Dearborn and Cleveland iron foundries are making growing use of the process.

Ford uses the dumpbox, strikeoff, and blowing methods. In one instance, shell molds are used as refractory liners for permanent molds in which ferrous metals are poured. Shell molded parts include crankshafts, camshafts, valves, rear axle carrier cases, and others. Sand is precoated by the warm-mix method with liquid resin and alcohol and is moved to molding areas pneumatically.

Shell molds possess these eight casting advantages: Stability, permeability, thermal shock resistance, erosion resistance, penetration resistance, heat dissipation, hot rigidity, and hot collapsibility. In addition,

they offer good shelf life, transportability, and reclaimability.

The shell process also eliminates or minimizes casting defects of many conventional types, such as inclusions and hot cracks. It provides a good yield, and reclaimed metal usually needs no cleaning. At Ford, the scrap rate on shell molded castings is less than 1 per cent, and machined scrap is less than ½ per cent.

The process takes less space, is safer, and lends itself to automation. Machining costs are cut nearly in half when the shell process is used, and the designer gets closer running tolerances. Higher production costs are offset by savings elsewhere.

CORE and MOLDING SAND

● CHARACTERISTICS, properties and handling of sand were considered at the Sand Division's five technical sessions and a dinner. Included were discussions on surface area and grain shape, silicate and resin bonding, segregation, tensile and shear strength, tempering, expansion, scab formation and compaction, as well as reports from committees.

Experimental Determination of Specific Surface and Grain Shape of Foundry Sands by Franz Hofmann, Georg Fischer Ltd., Schaffhausen, Switzerland. Presented by Victor Rowell, Harry W. Dietert Co., Detroit. A new piece of apparatus causes air to be drawn or sucked through a 50-gram sample of sand contained in a suitable graduated burette so that its volume also may be measured. Burette is attached to a U-tube containing a liquid column. Level of the liquid column is adjusted to create a suction of air through the sand in the burette.

In conjunction with developed formulas the author shows how specific surface area and grain shape of sand may be determined from the weight of the specimen, its volume, and the time required to draw a definite volume of air through the sand.

Critical Sodium Silicate - Sand Formulations for Optimum CO_2 Molding by R. J. Cowles, Walworth Co., Braintree, Mass. A laboratory investigation of sodium silicate binder was conducted to gain information on collapsibility, flowability, and surface conditions. Some 12 silicate binders with and without additions of sugar, silica flour, iron oxide, etc. were studied. Study led to setting up of standards to obtain satisfactory results with the binders. This was termed the critical amount of sodium silicate to provide sufficient strength and good collapsibility.

New Foundry Resins and Application Techniques for Shell Molds and Cores by W. C. Capehart, Monsanto Chemical Co., Springfield, Mass. Information was presented on characteristics of liquid and powdered phenolic resins. The former may be one or two-stage type. One-stage type is ready for use from the container while the two-stage type requires addition of a cross-linking agent, hexamethylenetetramine, to provide thermosetting characteristics. Powdered resins are two-stage type.

Either liquid or powdered resins may be used for producing coated sands by the hot or cold method. In the cold method, materials are at room temperature while in hot coating the sand is raised to around 225° F. New resins for manufacture of coated sand include a lump form ranging from ½ in. to 100 mesh in size, and water-borne resin.

The author discussed some of the operational problems encountered. Thermal cracking may be due to high resin content, sand segregation, overcuring, improper assembling or joining, warped shells, or high hydrostatic pressure. Peel back or drop off with cold-coated sand might be due to the sand being too wet. Caking of coated sand may be caused by poor solvent removal, too much moisture, high clay content, or insufficient cooling before storage.

How To Avoid Sand Segregation by W. D. Chadwick, Manley Sand Co., Rockton, Ill. Each time sand is handled there is segregation, which can be minimized to some extent by the handling method. In manual unloading of cars, the sand should be cut across the car perpendicular to the track. In belt conveyor unloading, the belts should be wide and operated at a relatively low speed.

Use of baffles at the discharge into bins breaks up the free fall of sand and causes less segregation. Less segregation is encountered with high-clay sands, in damp sand, and in fine sand. A motion picture showing the results obtained in discharging a bin loaded with sand through a single bottom opening located in different positions and through multiple bottom openings indicated that with the multiple openings the sand discharges uniformly in layers. With a single opening the sand forms a cone-shaped depression. Sand hangs on the sides and slides down intermittently.

The Mold Surface Committee reported that penetration of metal appears to be a completely mechanical action resulting from major effects of relationship of sand mass to metal, pressure head, and void size in the sand. Minor effects include metal superheat, metal composition, mold and core washes and coatings, glazing or sintering, gases and veining.

At the Sand Division dinner, J. B. Caine, Cincinnati, in an address **Let's Start Over** stated that present sand tests and technology are satisfactory from a control standpoint but fail in evaluating any sand since they have no foundation based on fact. There are no basic standards available.

In expressing density as 100 lb per cu ft we do not know whether it is too low, too high, or just right. The Basic Concepts Committee is trying to obtain some answers by starting over again and examining information from fields of soil mechanics and concrete aggregates. Studies in those areas have estab-

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Manganese, an element essential in cast iron, is available to the foundry industry in a number of ferro-alloys.

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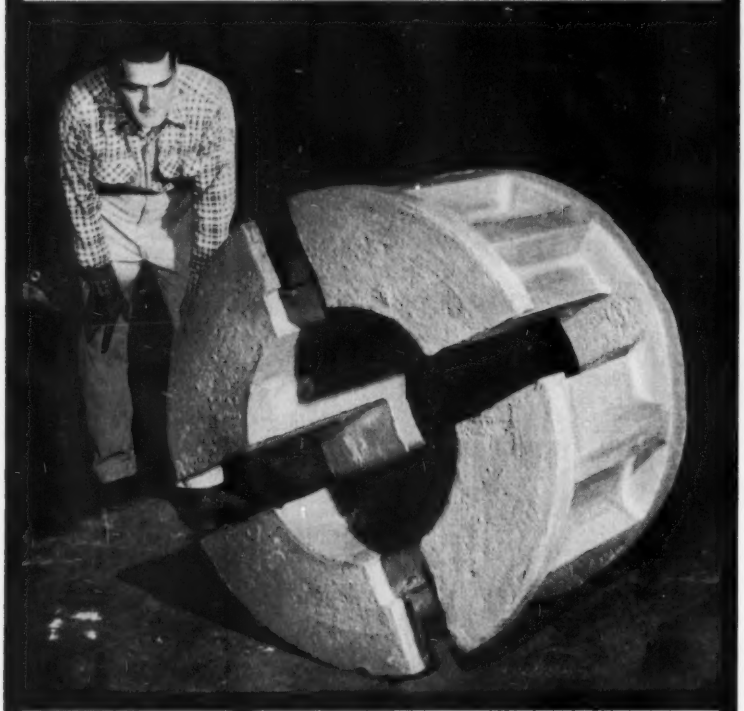

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lished some fundamental facts.

Hence, starting with dry unbonded spherical particles, it has been found that they compact to a density of 60.45 per cent solid which is unaffected by particle size—and this is an important basis for comparison. It also has been found that particle shape and especially distribution affect the density. Density of any type particle can be determined by a simple test. These densities of unusable dry unbonded sand grains form an important basic standard for the bonded sands used in production.

Green Tensile and Shear Strength of Molding Sands by R. W. Heine, University of Wisconsin, Madison, Wis., and E. H. King and J. S. Schumacher, Hill & Griffith Co., Cincinnati, presented by Prof. Heine. This investigation covered relationship of various properties of molding sands bonded with different amounts of clay and bentonite with suitable amounts of moisture to provide good flowability.

Data indicated a straight-line relationship between green tensile and green shear strengths which, in conjunction with other tests on mold hardness, can be used to predict the range of mold hardness most suitable for the sand. The authors point out that while a low clay content sand can be rammed to high hardness, the mold will tend to crack, drop, or hang up on the pattern. High clay content sands should be used for molds rammed to high hardness values.

Report of Core Stickiness Commit-

"We can cast it at half price if you only want half a casting"

tee was presented by J. R. Young, Cadillac Motor Div., GMC, Detroit. The only method which appears to have some merit is that of visual observation of sand placed in a corebox and dumped out. It is subject to error, however, and not recommended as a standard. Nevertheless, the test is useful where preparation of the sand is uniform at all times and the coreboxes are treated in a similar manner. Also it is necessary to consider a large number of cores and coreboxes to obtain good results.

Included in the report were a large number of factors which have an effect on stickiness, such as sand-surface phenomena, milling time and procedures, additives, corebox material, and sand temperature. With oil-bonded sand the water-cereal ratio affects flowability and should be controlled. Coreboxes should be lubricated and cleaned. Release agents in the sand should not be excessive, and storage and handling should be such as to prevent oxidation. With a water-soluble binder such as sodium silicate or urea, a release agent should be used to minimize sticking.

Report of Shell Mold and Core Committee was presented by R. J. Cowles, Walworth Co., Braintree, Mass. It indicated that progress is being made on test equipment for determining hot deformation for control purposes.

Tempering Molding Sand by Harry W. Dietert, Victor Rowell, and A. L. Graham, Harry W. Dietert Co., Detroit. Two fundamental test procedures are actual and compensated moisture tests. The actual moisture test, used when one wishes to know the sand moisture, gives moisture percentage of the base and evaporation water present at time of sampling.

The compensated moisture test gives sand moisture content without including the evaporation water. It is recommended for determining moisture content at the sand mixer where sand temperature fluctuates and it is desired to ascertain sand temper when it arrives at the molding stations.

Both test procedures must be followed carefully to obtain reliable results, and test equipment must be in excellent working order. Uniformity of sand is essential in ap-

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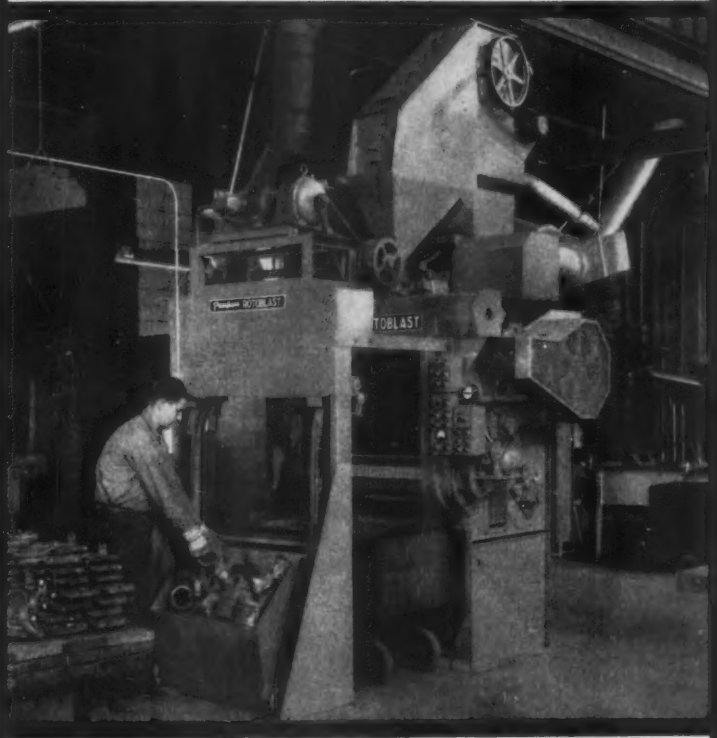

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plying moisture control by testing methods.

A high-strength sand may be tempered to a better workability by using ultimate deformation as the means of determining temper point. A high-strength sand controlled at a constant ultimate deformation will produce castings of better contour, less weight, less penetration, and less mold wall fracture losses than a low-strength sand, and with equal molding ease.

The Crust Separation Test for Investigation of Sand Expansion Defects by P. W. Goad, Institute of British Foundrymen, Australian Branch, Melbourne, Australia. Presented by L. E. Taylor, Ottawa Silica Co., Ottawa, Ill. This test permits the study of scab and rat-tail formation, including the influence of moisture content and varying sand mixes in causing these defects.

Test equipment incorporates a high-temperature (2372° F) heat source which, when sand strips are exposed to it, simulates the conditions experienced by the mold cavity surface as molten metal is poured into the mold.

Timing of Expansion Scab Formation by J. E. Haller, James B. Clow & Sons, Coshocton, Ohio. This report of a Sand Division subcommittee described tests in the pouring of step castings. Buckles developed in castings from which metal was poured before complete solidification, indicating the buckles were not due to pressure. Scabs and buckles are a function of sand expansion and occur at the time the mold is being filled. Excess moisture and too slow a pour also are factors in formation of the defects.

Sand Movement and Compaction in Green Sand Molding by T. J. Bosworth, R. W. Heine, University of Wisconsin; J. J. Parker, SPO Inc., Cleveland; and E. H. King, J. S. Schumacher, Hill & Griffith Co., Cincinnati.

Tests were conducted to study sand movement, density, and mold hardness developed by jolt and squeeze molding operations. During squeezing, a compacted layer of sand builds up in advance of the moving squeeze plate, and sends out a compaction wave of partially compacted sand in advance of its own movement. In jolting, a column of sand builds up over the pattern but does not reach the high density achieved with squeezing.

Compaction waves at the top of the mold from squeezing and compaction waves at the parting from jolting could, theoretically, be caused to meet and produce uniformly high-density molds. However, it is not possible to bring the two waves together because the sand column over the pattern prevents further downward movement of the flat squeeze plate. Unless the flask is shallow—4 in. or less—a low density zone will exist between the two high-density zones.

Various designs of contoured squeeze plates were studied in an attempt to prevent the building up of columns of sand over the pattern and also prevent the diversion of forces or wedging effects between pattern and flask. These studies resulted in specific rules for designing the squeezing frame. One important fact discovered was that uniformly high density and mold hardness was developed only when the proper amount of sand was used in the flask.

DUCTILE IRON

● NINE TECHNICAL papers on ductile iron and a luncheon discussion by gray and ductile iron groups dealt with as-cast and annealed tensile properties, melting methods, heat treatment, carbon flotation, the effect of tin on structure, a comparison of cast ductile iron parts with forged and welded carbon steel parts, and what designers and buyers expect of foundrymen.

Ductile Iron As-Cast and Annealed Tensile Properties, by A. H. Rauch, J. B. Peck, and E. M. McCullough, Deere & Co., Moline, Ill. Presented by Mr. McCullough. Tests were conducted to determine whether control of Brinell hardness and chemical composition of the iron would insure control of tensile properties of the castings. Through regression analyses a method was developed to calculate variation of tensile properties resulting from variation in Brinell hardness and composition.

Results show that tensile properties of as-cast pearlitic-ferritic ductile iron can be controlled by specifying Brinell and composition ranges. These specifications are in addition to those for graphite shape and permissible amount of primary cementite.

Tensiles of annealed ductile iron can be controlled by specifying composition. Additional specifications must cover graphite shape, permissible amounts of primary cementite, and the amount of residual pearlite allowable in the castings.

Ductile Iron Castings vs. Carbon Steel Forgings and Weldments, by J. B. Salbaing, International Nickel Co., New York. Development of ductile iron provides a material which has slowed the trend of specifying parts to be made as carbon steel forgings or weldments. The omnidirectional strength characteristic of castings is an important factor to be considered by designers of parts. Foundrymen should do stress analysis work to develop data on the strength and serviceability of cast parts and present it to designers.

Several examples of parts converted from forgings to ductile iron castings were shown.

Basic Cupola Method of Melting, by J. T. Williams, Grede Foundries Inc., Reedsburg, Wis. About half the ductile iron produced in 1957 was made in basic cupolas. The advantages of basic cupolas are that they produce a high temperature, low sulfur, high carbon iron suitable for making ductile iron, and the slag has good fluidity. The disadvantages are that initial and repair costs of linings are high, silicon loss is high, more slag must be handled, fluxing costs are high, and more exact control of cupola operation is required.

Indirect Arc Electric Furnace Production of Ductile Iron, by Louis Miller, Westinghouse Air

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Brake Co., Wilmerding, Pa. The indirect arc rocking furnace is simple to operate. With proper control, it will produce consistently high quality base iron for producing ductile iron. However, its capacity is small, and its melting rate is slow for ferrous metals. Furnace design does not permit refining or slagging operations.

Because the furnace lacks the electro-dynamic stirring action of induction and direct arc furnaces, operating temperature must be higher to dissolve graphitic carbon in the base iron prior to magnesium treatment. This results in high refractory cost.

The 1600-lb heats produced in the speaker's foundry are tapped into a ladle and treated with lanthanum-cerium alloy, then with magnesium in a metal container held in a plunger assembly having a cover which closes the ladle as the additive is plunged into the melt. With this method, about 50-55 per cent of the available magnesium is retained. The metal has less dross and oxide inclusions and is more fluid than metal treated in an open ladle. An 85 per cent ferrosilicon alloy, containing about 0.75 per cent calcium and 1.25 per cent aluminum, is added after the magnesium treatment.

Acid Cupola Method of Melting, by H. E. Henderson, Lynchburg Foundry Co., Lynchburg, Va. Starting in 1949 the foundry produced ductile iron in acid cupolas but had difficulty maintaining iron properties and a sufficiently high temperature. In addition, the cost was high.

After switching to basic cupola operation, difficulty was experienced with maintaining proper metal analysis and with carbon segregation to the cope.

In 1954 the foundry switched back to acid cupola melting with injection of calcium carbide for desulfurization. Specially - designed, water-cooled, hot blast cupolas having water-cooled copper tuyeres projecting inside the lining are used. Melting temperatures average 3000° F with an iron-to-coke ratio of 8 to 1. With calcium carbide injection less magnesium alloy is required.

Lynchburg engineers feel that maintaining the correct relationship

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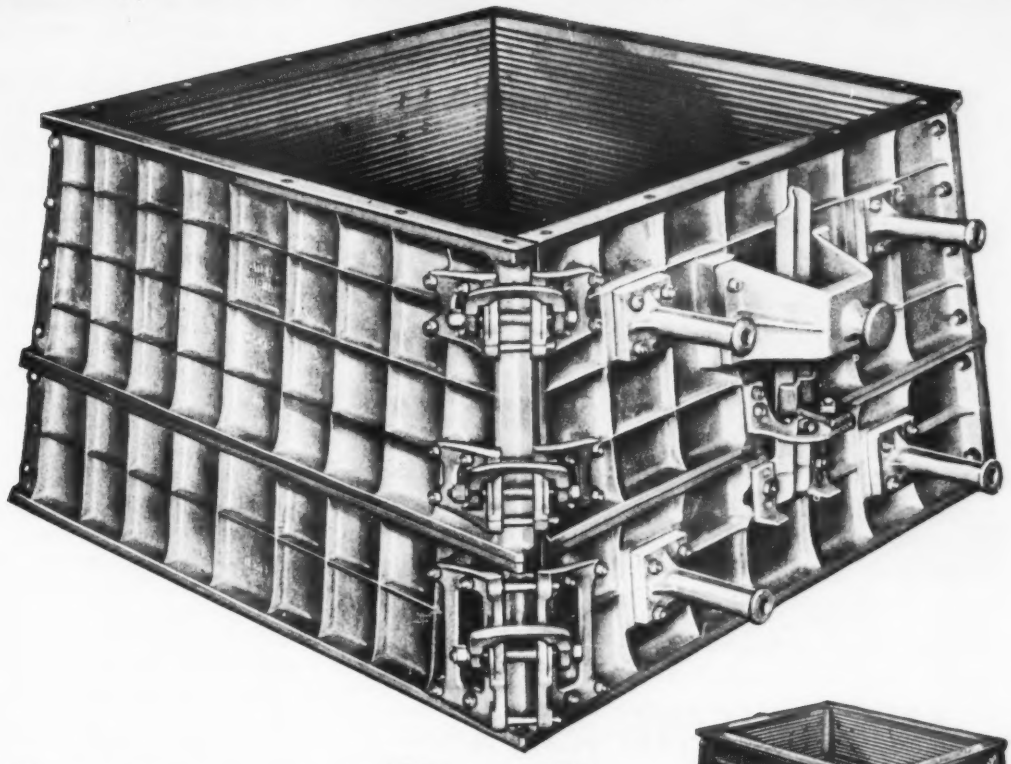
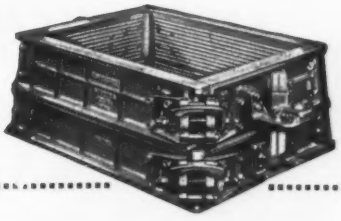


Large or Small



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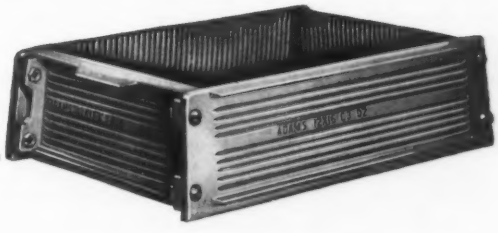

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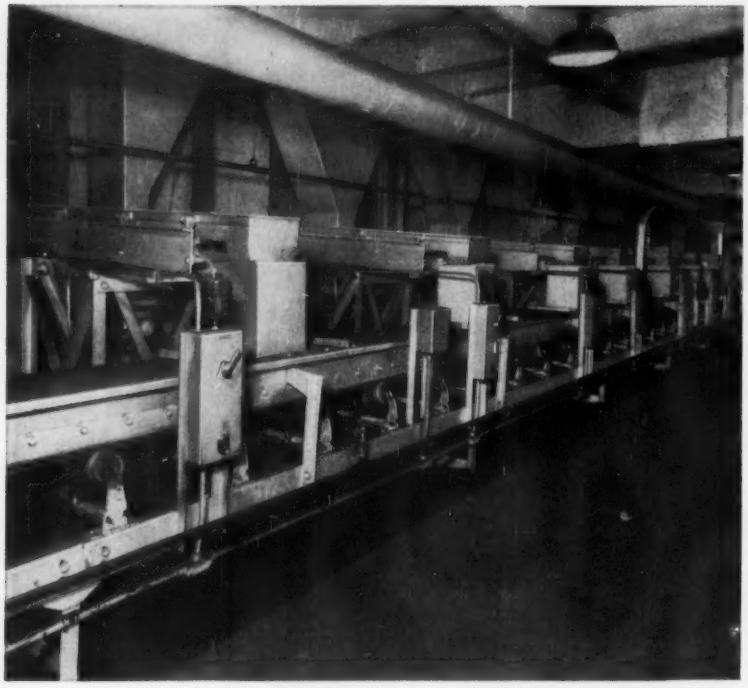

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between sulfur, magnesium, and cerium is essential to successful casting of as-cast ductile iron. Their test results show they cannot maintain proper melting control with a basic cupola.

Production of Ductile Iron in the Basic Direct Arc Furnace, by C. R. Isleib, International Nickel Co., New York. Results of studies on production of ductile iron in the basic direct arc furnace were reported. The advantages and disadvantages were outlined.

Heat Treatment of Ductile Iron, by W. D. McMillan, International Harvester Co., Chicago. Three methods of heat treatment—a full ferritizing anneal; a subcritical draw for machinability, retaining as-cast tensile properties, and a two temperature normalizing to improve machinability of small castings—used at the author's foundry were described. It was pointed out that the processes pertain to this foundry and would not necessarily apply without modification to the products of other foundries.

Carbon Flotation in Ductile Iron, by A. H. Rauch, J. B. Peck, and G. F. Thomas, Deere & Co., Moline, Ill. Presented by Mr. Peck. Solidified samples of basic cupola iron treated to produce nodular iron are pulverized and analyzed for carbon. Castings from the same heat are fractured and inspected for carbon flotation effect. Test results indicate that if carbon equivalent of the iron is 4.55 or greater, proeutectic carbide will float to top surfaces of castings.

During discussion it was pointed out that, under the condition cited, flotation occurred in all test castings which covered the range of ½ to 2-in. section sizes. The flotation band seldom is wider than 1/16 to ⅛ in. Fluxing agents seem to have no effect on flotation. Current work is under way to study effect of pouring temperature on thickness of the flotation band.

The Effect of Tin on the Structure of Flake and Ductile Irons, by E. C. Ellwood, Tin Research Institute, London, England. Presented by J. A. Davis, Battelle Memorial Institute, Columbus, Ohio. Literature on the use of tin in gray and ductile iron is reviewed and new work presented. Results of the new work show that tin sta-

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bilizes the pearlite in both types of iron. Mechanical properties are raised with tin contents up to 0.1 per cent with no undesirable side effects. Larger amounts of tin cause a slight decrease in mechanical properties. The tin addition does not increase chill depth or form massive carbides.

During discussion it was pointed out that tin is added to metal in the furnace or in the ladle before any inoculating treatment. Tin recovery is about 90 per cent and is not oxidized. That fact must be considered when adding tin to charges containing remelt.

What Does the Casting Designer and Buyer Expect of the Foundryman? by T. O. Kuivenen, Cooper-Bessemer Corp., Mt. Vernon, Ohio. Designers and foundrymen have the common job of furnishing a successfully functioning product. Five areas are important to the achievement of this goal:

1. *Strength of Casting*—Designer obtains data on properties and characteristics of a material from the foundryman, who bases them on test bar data. Unfortunately, there are no standardized procedures for determining correlations between test bars and castings. It is necessary for the buyer to cut up castings scrapped for machining errors, etc., to get data on section strengths.

2. *Casting Soundness* — Castings must stand dynamic loads, and stress concentrations resulting from

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defects can't be tolerated. The foundrymen should help the designer to avoid designs which lead to flaws.

3. *Dimensional Control* — Design skill has increased through the use of stress measuring techniques such as brittle lacquer, photoelastic methods, and strain gages. Improved design presents foundrymen with greater demands to produce castings with specified dimensions and shapes.

4. *Communication* — Better communication between designer and foundryman is essential. Cast parts must be producible as well as functional. The designer should be helped to specify the best, most castable design.

5. *Economics*—Cost can't be ignored. Each method of fabrication has its place and must be considered. The place of the casting process in the cost picture is the best, and it still is improving.

STEEL CASTINGS

● FOUR technical sessions and a roundtable luncheon were sponsored by the Steel Division. Among topics discussed were stress concentration and castibility, design of steel castings, physical properties, reclamation and dimensional accuracy of silicate-bonded sand, and vacuum melting.

Interrelation between Stress Concentration and Castability by J. B. Caine, consultant, Cincinnati. A close relationship exists between shapes designed to minimum stress concentration, maximum load carrying ability, and the castability of such shapes. The designer and foundryman are in basic agreement on this subject to the point that most, if not all, shapes designed for minimum stress concentration are shaped for maximum castability.

For years the foundryman has been trying to interest the designer and engineer in designing for castability. The results of this campaign have not nearly equaled the efforts expended on it. Perhaps one reason is that the approach is psychologically wrong. The designer and engineer are not particularly interested in the problems of the foundryman. They are interested in load-carrying ability, but should be interested in the mutual problem of load-carrying ability and castability.

The examples discussed were only a few that illustrate this mutual problem. The designer's interest in stress concentration can almost always be translated into foundry terminology by substituting "strain" for "stress." The shape that plagues the foundryman with defects due to contraction strain concentration during solidification and subsequent cooling is prone to plague the designer through stress concentration in service.

To illustrate this mutual problem, the author summarized the known information on stress concentration of a few simple shapes, and correlated this information with heat transfer data on similar shapes. The simpler shapes must be understood first to understand properly the stress pattern of more complicated shapes.

Then, too, as the shape becomes more complicated to the point of most castings, generalization based on theoretical and photoelastic studies of stress concentration and thermal analysis of strain concentration becomes less precise. Each shape, or small groups of shapes, must be studied as individuals through stress analysis by brittle lacquer or strain gage techniques.

Aid for the Design Engineer—Accentuate the Positive by J. J. Henry, product development director, Missouri Steel Castings Co., Joplin, Mo. The casting process has many advantages over other methods of manufacturing. Calling the designer's attention to these positive factors of the cast process will aid him in producing structures and machinery that are stronger, safer, and more economical.

References were quoted to show the influence of design on the strength of structures and why castings can produce stronger components than other methods. Examples were shown to illustrate superiority of the cast process and suggestions given on how the foundryman can help the design engineer.

Some of the beneficial factors of the cast process and methods that the foundryman can use to help design engineers are:

1. Design freedom. Provide tables containing information on the properties of irregular sections that can be produced most economically by the casting process.

2. Reduction of stress concentrations. Install stress laboratories to evaluate designs for possible high stress areas.

3. Low end cost. Demonstrate how castings can provide the best weight-strength ratio and eliminate some machining, joining, and handling.

4. Uniform strength. Install quality control methods, and give particular attention to highly stressed areas.

5. Improved appearance. Use best materials and methods available to produce smooth castings with streamlined features.

6. Choice of properties. Provide design engineers with data on types of metal produced, and methods of obtaining variations in physical properties.

A Method of Obtaining Both Castability and Maximum Field Service from Cast Products by J. W. Beckham, Texas Foundries Inc., Lufkin, Tex. In recent years, the foundryman has become more aware of the need to work with the designer to get the best service from castings. Almost invariably, a good design has good castability. Six years ago, the author's company set up a separate department to accomplish closer relationship between the foundrymen and designer.

In approaching the matter of design, the foundry must know how many castings are needed, the time available to make the castings, the loads the castings must sustain, the weight of the castings, etc. A good casting design uses all of its metal

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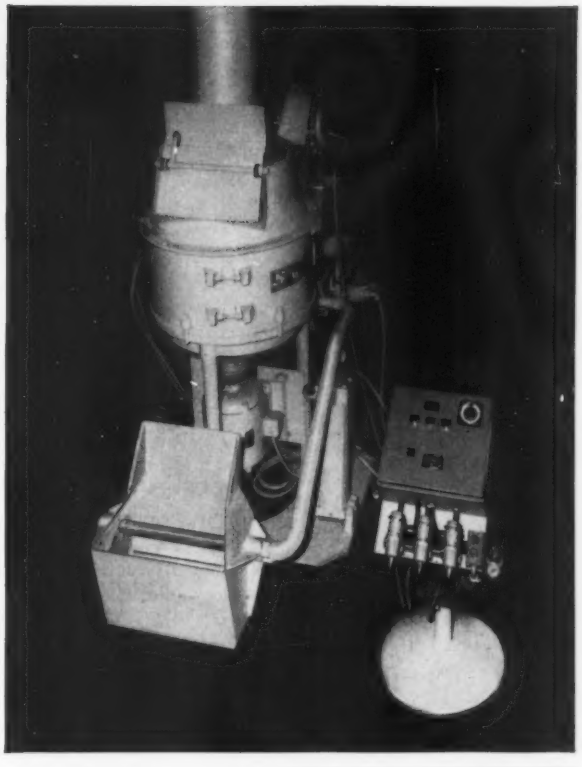

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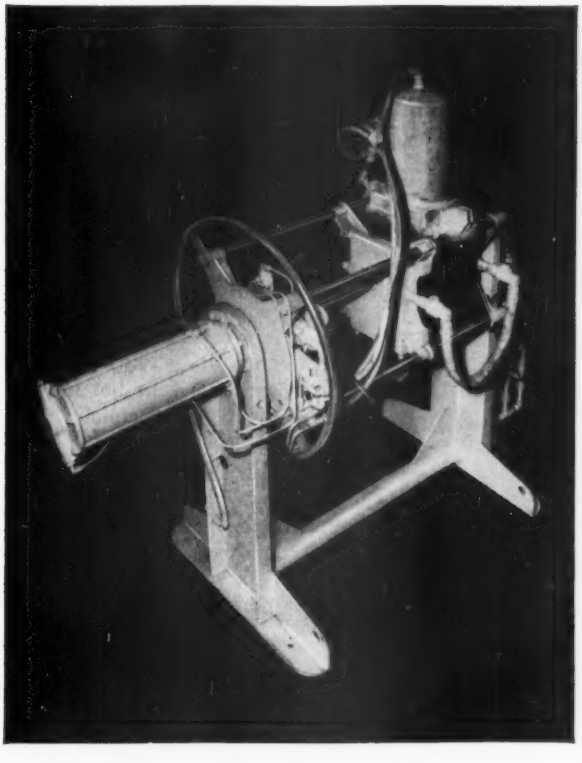

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efficiently. After the basic data are in hand, the first step is to make a freehand sketch. Then make some type of a model. After a master pattern is prepared, make a casting for checking as to gating, risering, and dimensional accuracy.

Next, machine the casting and make a stress analysis with brittle lacquer. Strain gages can be used in making further tests. Castings made by the method outlined are considered designed for field service.

Properties of Some Cast and Wrought Alloy Steels for Use at Elevated Temperatures by R. K. Buhr and W. A. Morgan, Physical Metallurgy Division, Department of Mines and Technical Surveys, Ottawa, Ontario, Canada. This report presented the cast and wrought properties at room and elevated temperatures for two known and two new low-alloy high-strength steels. Three of the steels display secondary hardening, and the mechanism involved in this phenomenon was investigated.

The castings were shown to possess many desirable properties over their wrought counterparts, especially when used at elevated temperatures where the differences in mechanical properties became quite small. In the unnotched condition, longitudinal fatigue properties are superior to those found in castings, but in the notched condition the cast and longitudinal fatigue properties are nearly identical.

Secondary hardening was investigated using electron microscopy and electrolytic carbide extraction techniques. These tests verified that secondary hardening is due to the precipitation of fine alloy carbides.

The Significance of Reduced Phosphorus and Sulphur Content on the Ductility and Toughness of Cast Low-Alloy Steels by J. Zotos, Rodman Laboratory, Watertown Arsenal, Watertown, Mass. A developed basic electric arc furnace melting practice was employed to produce low-sulfur and low-phosphorus 1040, 4140, high-nickel 4325, 4330 and high-silicon 4340 type steel castings. Castings were analyzed chemically and the high-nickel 4325 and 4330 cast steels were subjected to various heat treatments and physically tested.

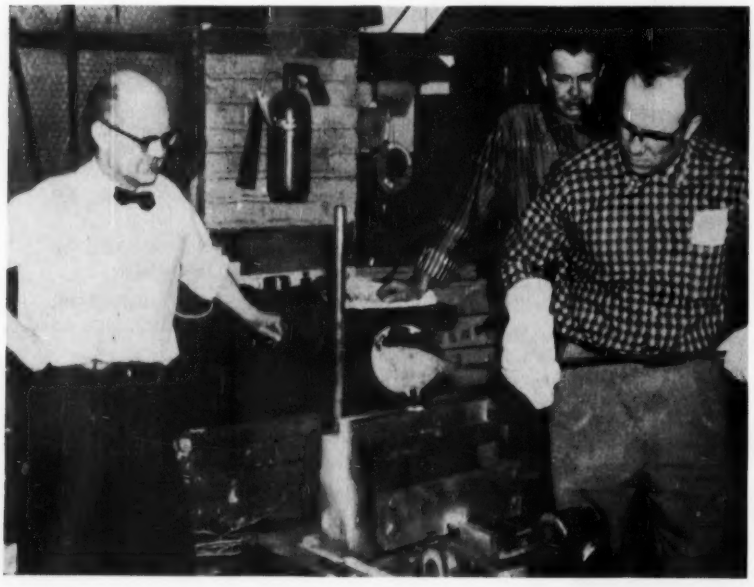
A decrease in the sulfur content of the high-nickel 4325 steel castings resulted in a significant increase in the reduction in area, impact strength and elongation, while maintaining a constant strength level. A decrease in both the phosphorus and sulfur content of several 4325 and 4330 steel castings also resulted in a significant improvement in their ductility and impact resistance.

Foundry Characteristics of Mn-V-Mo Age Hardening Steel by N. C. Howells and E. A. Lange, U. S. Naval Research Laboratory, Washington. This report was a continuation of the authors' paper presented at the 1958 AFS Convention. Naval engineers designing hardware for minesweepers are handicapped because they lack suitable high-strength, nonmagnetic casting alloys. Nonferrous alloys and conventional austenitic steels have limitations with regard to yield strength, modulus of elasticity, endurance limit or machinability. In recent years, compositions of wrought steels with austenitic microstructures have been developed which can be age hardened to high hardness levels and yield strengths in the range of 88,000 to 147,000 psi.

Whereas the previous investigation was concerned with Cr-Ni-P, Cr-Mn and Cr-Ni-Mn-V types of age-hardening austenitic steels, the current one dealt with the Mn-V-Mo type. Molds were made from zircon sand and baked over night. Large risers and choke gates were used. Pouring temperature was high and the castings were shaken out as hot as possible. The castings could be hacksawed in the as-cast condition. Machining operations employed were the same as for 18-8 stainless steel castings.

Designing for Press-Forged Castings by P. R. Gouwens, Armour Research Foundation, Chicago. Press forging is a combination of casting and forging at selected temperatures. Compared with hot forging, press forging is essentially cold working.

A test-bar-shaped block was cast and the test bars were cut from the center of the block. Only the center section of the bar was press forged in the experimentation. The investigation sought to show the following advantages accruing from press-forging: (1) Higher ultimate tensile strengths; (2) corresponding increases in proof and yield strengths without the corresponding



ALUMINUM WORKSHOP: Apex Smelting Co. was host to the first Aluminum Workshop sponsored recently by the Educational Committee of the Northeastern Ohio Chapter, American Foundrymen's Society, in Cleveland. Attending were foundry and pattern instructors of local high schools who saw demonstrations of melting, fluxing, and pouring of aluminum alloys, plus inspection practices. Edward Trela, left, Apex research metallurgist, was director

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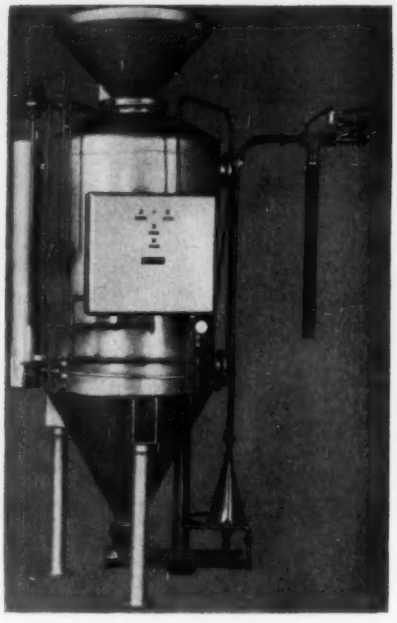

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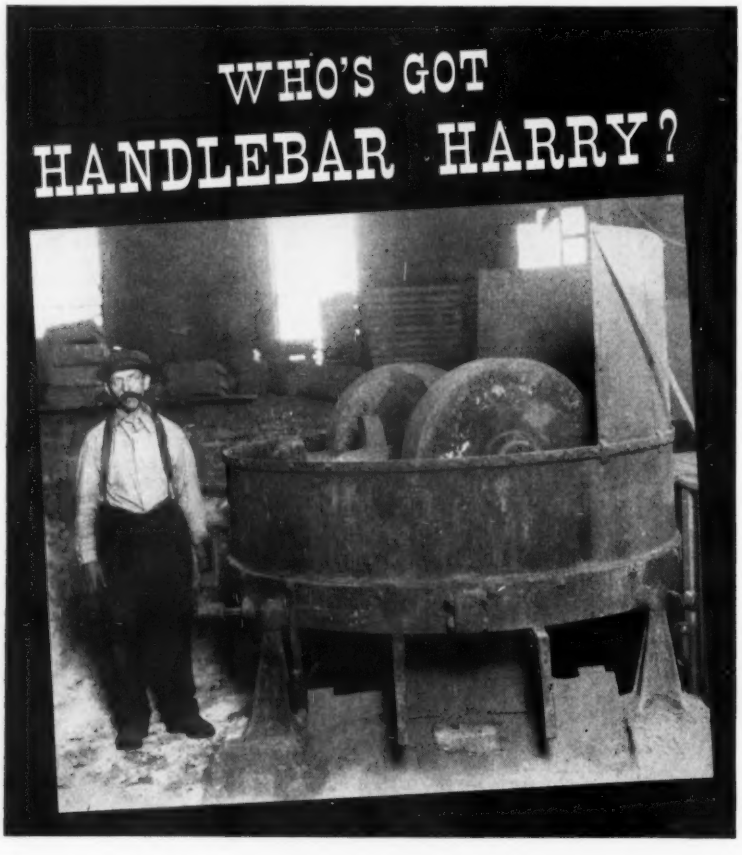

degree of ductility loss; (3) relative freedom from directional properties typical of forgings; (4) better resistance to impact and fatigue loads; and (5) reduced lead time and costs compared with forging for prototype parts.

Conclusions reached were: (1) Press-forging achieves worthwhile improvements in mechanical properties; (2) the improvements exceeded those possible by heat treatment alone; (3) directionality of properties is avoided; (4) the process can be applied locally to certain critical areas of castings; (5) die material requirements are such that casting of such dies is practical; and (6) design limitations are more akin to forgings than to castings.

Reclamation and Dimensional Accuracy of Sodium-Silicate Bonded Sand, by G. C. Warnecke, National Malleable & Steel Castings Co., Melrose Park, Ill. One object of the investigation was to determine if this sand can be reclaimed. If sodium-silicate bonded sand cannot be reclaimed, its use in the foundry might prove to be economically unsound.

The casting used in the test was the standard test block of the Steel Founders' Society of America. The sand used in making the castings was reclaimed by two methods—by pneumatic scrubber and by aerated speed muller. Five groups of castings were made after as many reclamations by each method, and the surface finish of the castings was compared with that obtained on castings made in the original sand. It was found that sodium-silicate bonded sand can be reclaimed and that either method of reclamation is satisfactory.

The second objective was to study the dimensional accuracy of steel castings made in sodium-silicate bonded sand compared with castings made in the standard green sand molds. The casting selected was a standard production casting. Eighty-four of these castings were made in molds of new sodium-silicate bonded sand and these were checked dimensionally against 84 identical castings selected from the production run in green sand molds. In general, the sodium-silicate sand mold castings gave an as-cast accuracy approximately twice as great as the green sand castings. In other

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words, the tolerance of the castings made in the bond sand was half that of castings made in green sand.

Rapid Hydrogen Determination for Steel Foundry Control, by C. C. Carson and B. J. Alperin, General Electric Co., Schenectady, N. Y. This paper described a method which is rapid, simple, and economical. It uses the extraction technique for extracting hydrogen from steel, and employs a Pirani gage for analysis of the extracted gases for hydrogen by the thermal conductivity technique. The furnace section is made a part of the gas collecting volume.

Comparison of results with those obtained with a conventional apparatus and procedure employed for the hot extraction technique shows satisfactory agreement. For a sample size of approximately 2 grams, the determination is completed in 5-10 minutes from the time the sample enters the hot zone of the furnace. The time from the sampling of a molten bath to completion of an analysis is about 15 minutes.

Requirements for Quality Steel Castings by Y. J. Elizondo, Chance-Vought Aircraft Co., Dallas, Tex. This dealt with castings for airframes, which are the skeletons or primary structure of airplanes. Some 95 steel castings are used in this application, some weighing up to 175 lb. The trend in use of castings could be up if the rigid requirements can be met. Skin temperatures range from 300 to 600° F and in experimental work they sometimes go as high as 2000°.

Holding castings to specified weights is imperative. Only about 19 per cent of aircraft parts are critical in tension. A high guaranteed minimum strength is needed. Suppliers of steel castings to the aircraft industry will have to look on elevated temperature strengths at around 1000° F, as commonplace. In these castings it is a matter of weight as well as fit. Finish must be superior also.

There is urgent need for rigid specifications for aircraft castings and casting alloys. To make castings that are acceptable to the industry, foundries will have to improve their process controls. Weight tolerance must be extremely close because the alloys used in aircraft

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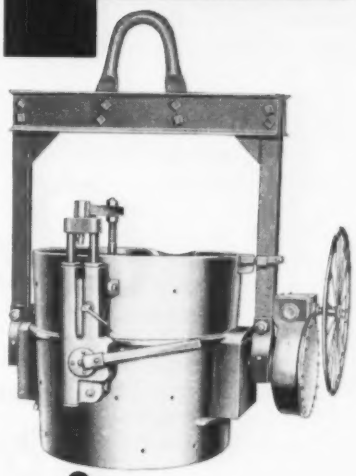

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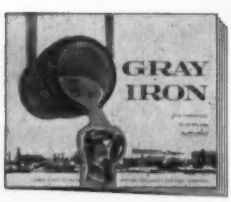

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applications are hard to machine.

Foundry Designing for Steel Castings by A. B. Steck, Metallurgical Associates Inc., Melrose, Mass. How often does one hear the complaint "that casting is poorly designed?" If the blame for a bad casting is laid to design, what do you blame for a good casting? The usual and quickest way to get out of trouble when castings come out bad is to make changes in foundry practice. But frequently too many changes are made at one time and when good castings are obtained it isn't possible to determine to what change the success is to be attributed.

Before blaming design for misruns, it is advisable to check molding practice, sand, cores, and other factors. Solutions to problems are often found here. Hot tears are a common defect in steel castings, but seldom can they be traced to casting design.

Design and Welding of Castings for Steam Turbine Applications by L. W. Songer, General Electric Co., Schenectady, N. Y. Service requirements of modern steam-turbine generator equipment necessitate that castings and cast weldments be of the highest quality and have maximum reliability. The requirements for proof of quality, and control of all phases of manufacture, are far more exacting than those for structural castings most foundries are accustomed to making.

Foundries can contribute much more to proper design of quality castings by a careful evaluation of the customers' needs and by the application of modern foundry engineering practices. Quality of complex castings often can be improved by casting high-quality individual parts and assembling them by welding.

Sound welds can be made in heavy-walled, low-alloy steel castings if closely controlled procedures are followed. Quality control and proof of quality is necessary to guarantee minimum service requirements.

There is a good potential market for high-grade castings, but an educational program to better inform designers and users of castings of the advances made in the casting industry is needed to fully exploit this potential. Moreover, aggressive efforts should be maintained to minimize the possibility of losing even more casting work. Foundries willing to devote engineering effort today to improve and understand the functions of their castings will be the leaders and profit makers of tomorrow.

At the Steel Division roundtable luncheon, S. J. Noesen, General Electric Co., Schenectady, N. Y., discussed **Vacuum Arc Melting.** It was pointed out that the money which the government has invested in missiles and allied research can be lost if metallurgists can't melt and purify the metals which are required. These are the superalloys and refractory metals.

The refractory metals are columbium with a melting point of 4380° F, molybdenum at 4760°, tantalum at 5425°, and tungsten at 6170°. At near their melting point, refractory metals react violently with the atmosphere. As a consequence, a melting method is needed which is free of the crucible effect and which won't contaminate.

The physical properties of these refractory metals are affected by small amounts of other elements. It is for the foregoing reasons that vacuum arc melting is attracting growing attention.

R. A. Flinn and L. H. Van Vlack, University of Michigan, Ann Arbor, Mich., presented the final report for the AFS Steel Division Research Committee on Deoxidation Defects in Steel Castings. Nonmetallic macroinclusions, commonly described as "snotters," are a frequent cause of scrap or lead to inferior machinability of the cope surface of steel castings. Mechanically entrapped sand and scabs are not included in the preceding designation.

The three objectives of the investigation, under way during the last four years, were to: (1) Identify these inclusions; (2) trace their origin in foundry practice; and (3) suggest methods of elimination. The results were summarized as follows:

Nature of Inclusions. In steel deoxidized with aluminum, the cope inclusions contain the mineral species corundum (Al_2O_3) surrounded by reaction products formed by later reactions between the corundum, the mold material, the metal, and the atmosphere.

Origin of Inclusions. Detailed explanation was given to prove that the essential feature of the defect, the corundum, can only originate in the metal as a result of deoxidation with aluminum.

Methods of Elimination. Mechanical techniques of settling, skimming, and trapping, as well as the use of complex deoxidants to form other deoxidation products, may offer solutions.

It was announced at the luncheon meeting that D. N. Rosenblatt, chief metallurgist, American Foundry & Machine Co., Salt Lake City, Utah, will be the new chairman of the Steel Division. He succeeds A. J. Kiesler, metals and ceramics research department, General Electric Co., Schenectady, N. Y. New secretary will be William A. Koppi, metallurgical engineer, International Nickel Co. Inc., New York.

PLANT EQUIPMENT

● TWO talks were presented at the single session conducted by the Plant and Plant Equipment Committee.

The Foundry Plant Engineer by James Thomson, retired chief works engineer, Foundry & Mill Machinery Div., Blaw-Knox Co., East Chicago, Ind. For the last three or four decades American industry has been traveling along in what might be termed the "mass production era." The many developments in methods, materials, and equipment which have resulted in a tremendous increase in the country's productive capacity have been accompanied by a growing appreciation of the role of the plant engineer.

At the turn of the century there

were few, if any, men who might be termed foundry plant engineers. In fact, foundries offered little appeal to engineers as desirable places in which to work. Tracing his experiences in the foundry industry, Mr. Thomson indicated how various plants gradually began to realize the value of the engineering approach to many of their problems; he also pointed out the part played by foundry plant engineers in the development of much new or improved foundry equipment.

Step by Step Development of Preventive Maintenance Scheduling Systems for any Size Foundry, by K. M. Smith, Caterpillar Tractor Co., Peoria, Ill. Any preventive maintenance system should be based on an analysis of why machines fail and the making of changes or repairs on a regular basis to prevent future failure. As an aid to determining required maintenance work, it was suggested that photographs of installed machines be studied to see what work needs to be done. Photos often highlight faults in equipment when they are not otherwise easily apparent.

A good maintenance program involves keeping records of machine performance and reasonably detailed data on when and what maintenance work was performed. Record-keeping can be facilitated if each machine is numbered and the records kept by number.

Maintenance work can be scheduled from data recorded on IBM cards or by using color-coded tags hung on a scheduling board. Color codes can indicate urgency of the work required or the type of work that is to be performed.

DIECASTING & PERMANENT MOLDS

● IN ITS SECOND YEAR, the diecasting and permanent mold division presented a luncheon and two technical sessions. Speakers discussed vacuum diecasting, metal costs, thermal aspects of permanent mold operation, permanent molding of gray iron, roughness standards for cast surfaces, and two new aluminum diecasting alloys.

Vacuum Die Casting by G. R. Morton, Morton Mfg. Co., Omaha, Nebr. A proprietary vacuum diecasting system evacuates air from one side of the die cavity as metal enters the other side. The only vacuum is in the die cavity. Cycle speed is faster because the die need not be cleaned and no vents are present to clog. The faster cycling means that more water cooling is needed in the die.

This system can be fed automatically for more than 300 shots per hour on a two-shift basis. The automatic feed is by vacuum. It is believed that there is some degassing action on the metal at the time the vacuum is pulled. Leakers have been cut as much as from 60 per cent to 0.1 per cent. The system can be used with either zinc or aluminum and with castings up to 60 or 70 lb.

Metal Costs and Its Practical and Analytical Evaluation in Aluminum Diecasting by G. H. Found, Arthur D. Little Inc., Cambridge, Mass., and John Lapin, Central Foundry Div., General Motors Corp., Saginaw, Mich. Presented by Mr. Found. Metal cost has become the most important cost item in diecasting. Direct labor and other factors used to be as large, but improvements in techniques, handling, and equipment have altered the situation. Metal cost is higher with larger castings, even though fewer are made per hour.

Downgrading of costly alloys should be avoided by proper selection of alloys. The diecaster must be able to make necessary routine tests for composition and properties. Metal loss occurs during melting of ingot, scrap, and biscuit, gates, and flash. Sloppy melting with excessive dross is common in remelting of the biscuit, etc.

Excessive casting weight is a major source of metal waste. The designer has an obligation to use metal efficiently. Minimum wall thicknesses, close tolerances, and elimination of parting-line flash help to reduce this waste. The alloy must be matched to the castability problems. Other factors which affect metal conservation include ingot size, use of the proper melting method, and effective fluxing and refining.

Thermal Aspects of Cyclic Permanent Mold Operation by C. L. Goodwin and H. Y. Hunsicker, Aluminum Co. of America, Cleveland. Presented by Mr. Goodwin. Some permanent molds are heated only by the molten metal, and some have a supplemental heat source. Still others are cooled. In experimental tests, molds were cooled only by radiation, conduction, and convection. Thermocouples were cast in 356 alloy plate castings 6 x 15 in. by $\frac{1}{4}$ to $\frac{1}{2}$ in. thick. These castings were poured until dynamic thermal equilibrium was attained—that is, the same temperature for the same cycle time.

Results show that frequency affects mold temperature and increases solidification time. Casting section thickness has a greater effect on cycle time than mold section thickness, although the latter is important, too. When solidification time and cycle time are the same, the frequency cannot be increased unless the mold is cooled. Continuous running aids both casting quality and mold life.

Permanent Molding of Gray Iron by H. U. McClelland, Eaton Mfg. Co., Vassar, Mich. Permanent molded gray iron castings are made in a turntable-type machine which carries molds through a four-part cycle: 1. Mold preparation, in which a thin coating of carbon is deposited on the mold face. 2. Core setting, if needed. 3. Pouring. 4. Ejection or shakeout of casting.

Mold halves are of essentially the same analysis as that of the castings produced in them. Castings for the mold halves are made by conventional means in oil or green sand or by the CO_2 process.

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All castings are annealed to eliminate chilled areas induced by the metal molds. The Brinell hardness range is 170-207, and tensile strength is from 30,000 psi up, depending on section size. Usual tolerance on exterior dimensions is ±0.025 in. Casting weights range from a few ounces to 25 lb.

A Hypereutectic Aluminum-Silicon Alloy by R. Kissling and O. Tichy, Apex Smelting Co., Cleveland. Presented by Mr. Kissling. Near eutectic and eutectic aluminum-silicon alloys have been in use since the early 1920s, when the sodium modification process made their use practical. This process was not, however, effective for the hypereutectic aluminum-silicon alloys. The latter have desirable characteristics, but are not heat treatable or easily machinable.

A new hypereutectic aluminum-silicon alloy has been developed which employs modifying alloy additions to change the structure of the silicon so that it is machinable. It is claimed to be the key to a die-cast aluminum automotive block without liners and also to be ideal for pistons, brake drums, and other parts.

Evaluation of Cast Surfaces for Roughness Standards by Eldon Swing, Boeing Airplane Co., Wichita, Kans. Surface roughness is particularly important where mating cast surfaces are involved. Visual cast surface gages have been developed which do a good job. These gages can be checked with a profilometer or by photomicrograph techniques. Exceptionally fine surfaces, under 63 roughness height rating, require machine surface gage measurement. The roughness height rating, or rhr, can be correlated with root mean square, or rms, measurements if they are desired.

A New Aluminum Die Casting Alloy by J. H. Moorman and E. V. Blackmun, Aluminum Co. of America, Pittsburgh. Presented by Mr. Moorman. Alloy 364 is a new die-casting alloy designed to have the same desirable characteristics of alloy 218, but with better castability. It contains 8½ per cent silicon and is prepared like 360 alloy. Temperature required is 1220 to 1225° F. Frequent stirring is helpful. The alloy is aged 10 hours at 340° F for high yield strength and good ductility. Its castability is better than that of 218 alloy, and 364 is particularly good for parts which require high ductility, impact strength, yield strength, and tensile strength.

FUNDAMENTAL PAPERS

● Widely diversified topics relating to solidification mechanisms, grain refinement, mass and tensile strength, fluidity, linear programming, and high-strength steel castings were presented at three technical sessions on fundamentals.

Considerations of the Mechanisms of Solidification of Gray Iron by Albert DeSy, University of Ghent, Ghent, Belgium. The speaker discussed changes in free energy which occur due to change of state from liquid to solid and also surface forces involved in producing solid embryo in the liquid melt.

After describing the role of foreign nuclei in permitting the formation of much smaller stable nuclei, the solidification of simple and polyphase systems with particular emphasis on eutectics was dealt with. The discussion then turned to the solidification of normal eutectics in which their growth obeys the laws of Straumanis and Velaiew, and the solidification of abnormal eutectics which do not follow those laws.

Solidification of iron-graphite eutectics shows eutectic cells formed through solidification of austenite followed by solidification of graphite in undercooled liquid containing a concentration of carbon surrounding the solidified austenite. This results in formation of graphite flakes in rosette form or type B graphite.

Grain Refinement of Solidifying Metals by R. G. Garlick and J. F. Wallace, Case Institute of Technology, Cleveland. Presented by Mr. Garlick. Application of vibration to solidifying metals results in differences in grain refinement of various metals and alloys. This action is attributed to the alternate waves of pressure and rarefaction which increase the nucleation temperature.

In the case of solid solution alloys this circumstance permits the formation of new grains before the dendrites or columnar grains advance. In the case of eutectic alloys, the increase in nucleation temperature allows formation of more cells and also coarsening of the grains. Investigation indicates that the greater the shrinkage characteristics of the metal or alloy, the greater the refinement. Exceptions are bismuth and gray iron, which have expansion characteristics but also exhibit some grain refinement through vibration.

Rationalization of Effect of Mass on the Tensile Properties of Castings by P. J. Ahearn, Watertown Arsenal, Watertown, Mass., and G. W. Form and J. F. Wallace, Case Institute of Technology. Presented by Prof. Form. Analysis of published data on effect of section size on the tensile properties of castings indicates that solidification time is of greater importance than section size.

Conversion of section-size data to solidification times and evaluation of the influence of those values on tensile properties resulted in a hypothesis for predicting the sensitivity of tensile strength to solidification time. This means that if the ductility during tensile testing is insufficient to exceed the necking strain, the tensile strength is reduced by increasing solidification times. If the metal is sufficiently ductile to exceed this limiting value, however, tensile strength virtually is unaffected by changing solidification times.

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J. E. Niesse, Crane Co., Chicago, and M. C. Flemings and H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass. Presented by Mr. Niesse. Investigation indicates that the mode of solidification accounts for differences in solidification. Pure metals freeze with smooth liquid-solid interfaces and long times are necessary for the freezing of enough solid to offer substantial resistance to liquid flow. Alloys freeze dendritically, and a relatively small amount of solid is able to prevent passage of further liquid.

Flow in a fluidity test ceases when some point is sufficiently solid to prevent passage of further liquid, and that point may be at the entrance of the channel, within the flowing stream, or at the forward tip of the stream, depending on alloy analysis and superheat.

Superheat is more effective in improving fluidity of pure metals than of alloys, due to a greater degree of remelting during flow in fluidity spirals of pure metals.

Fluidity Test for Aluminum Alloys; Tripling Fluidity with a New Mold Coating by M. C. Flemings, H. F. Conrad, and H. F. Taylor, Massachusetts Institute of Technology. Presented by Prof. Flemings. A new fluidity spiral for aluminum alloys causes the metal to flow from a pouring basin through a down sprue into a rectangular reservoir. Metal in the reservoir passes upward through a metal screen into a passage leading to the fluidity spiral.

Pouring basin and reservoir are formed of cores. Spiral is in green sand. Results indicate that fluidity spirals obtained are reproducible to within plus or minus 1 in. of metal flow.

In the study the application of coatings to the mold face was investigated. It was found that smoking through use of an oxyacetylene torch resulted in an improvement in fluidity of 130 per cent at 1250° F and 68 per cent at 1400° F. Hexachlorethane spray increased fluidity 190 per cent at 1250° F and at least 120 per cent at 1400° F with a coating thickness of 0.003 in. Increasing the coating to 0.006 in. tripled the fluidity at 1330 to 1305° F.

Linear Programming Applied to a Foundry Cast Problem by G. I. Gaertner, Watertown Arsenal, Watertown, Mass. Discussed a mathematical procedure for determining amounts and types of raw materials to produce the lowest cost charge to meet a specified composition. Involves setting up a large number of equations relating to the compositional characteristics of the materials as well as furnace operating conditions which preferably are solved by computing machines.

A paper on **Dimensioning of Sand Castings** by H. D. Merchant, Case Institute of Technology, was presented by title only.

Development of Low-Alloy Steel Compositions Suitable for High-Strength Steel Castings by Hugo R. Larson and Francis B. Herlihy, American Brake Shoe Co., Mahwah, N. J. Presented by Robert Ely of the same company. After studying the effect of variations of C, Cr, Mo, V, and Si on a steel with the base analysis of 1.00 per cent

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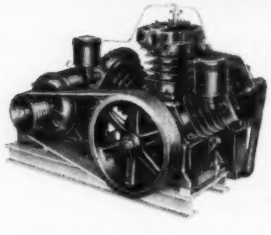

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Mn, 0.45 per cent Si, 1.85 per cent Ni, 0.90 per cent Cr, and 0.40 per cent Mo, use of a leaner alloy steel with a base analysis lower in Mn (0.80 per cent) and in Ni (0.50 per cent) was suggested.

With the latter composition it was found that higher yield and tensile strengths with lower ductility and reduction of area were obtained. For high-purity charge materials at 0.40 per cent C level the first alloy showed a yield strength of 215,000 psi, tensile strength of 280,000 psi, elongation of 7 per cent, and reduction of area of 13.5 per cent. Second alloy showed yield strength of 228,000 psi, tensile strength of 288,000 psi, elongation of 5 per cent, and reduction of area of 10 per cent.

Yield strength of the first alloy decreases with increasing C while that of the second alloy continues to increase with increasing C up to 0.45 per cent.

Comparison of X-ray Quality and Tensile Properties in Cast High-Strength Steel by Hugo R. Larson, Herbert W. Lloyd, and Francis B. Herlihy, American Brake Shoe Co. Presented by Robert Ely. High-strength steel was cast into plates 1 in. and ½ in. thick. One-inch plates were 6½ in. wide and 3¾, 5¾, and 7¾ in. long and the ½-in. plates were 6 in. wide and 2, 3, 4, and 6 in. long.

After heat treatment, plates were sectioned into alternate tensile blanks and ⅛-in. slices for radiographic examination. These were ground to 0.020 in. thick and radiographs examined under a microscope at 20 diameter magnification.

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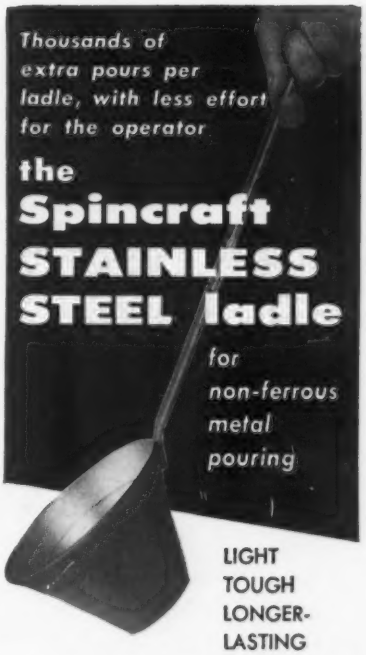

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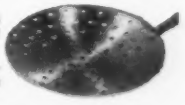

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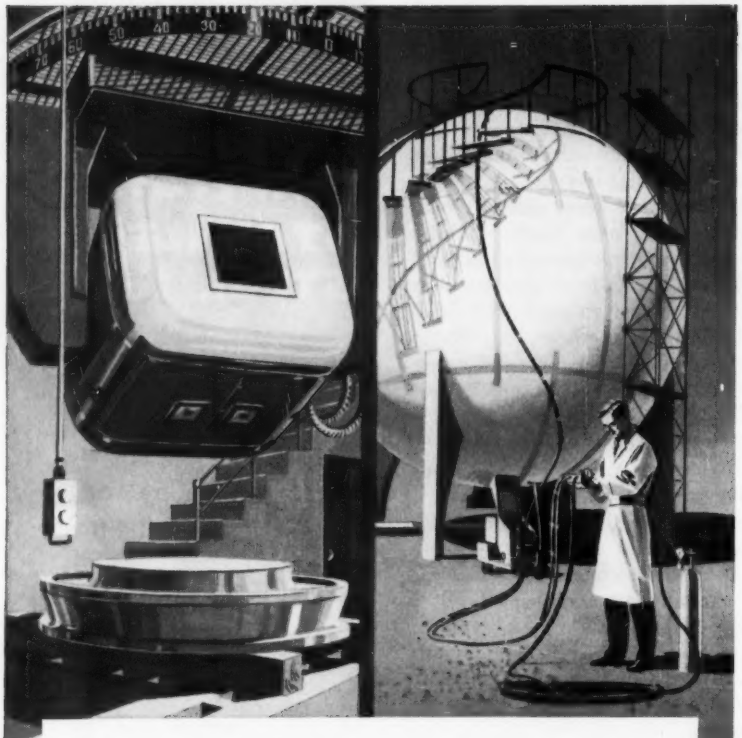

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sensitive method of detecting traces of shrinkage, and it was found that slight traces of microshrinkage have a rather pronounced effect on the ductility of tensile specimens of cast ultrahigh-strength steel.

Mechanical Properties and Processing Techniques for High-Strength Steel Castings by K. D. Holmes, John Zotos, and P. J. Ahearn, Watertown Arsenal. Presented by Mr. Holmes. Raw materials, melting and pouring practices, and heat treatments of high-strength Cr-Ni-Mo steel containing about 2.50 per cent Ni, 0.80 per cent Cr, and 0.45 per cent Mo were discussed. Steels were melted in arc and induction furnaces.

With high tempering temperatures in the 1200° F range with induction melted heats, tensile strength was around 160,000 psi, reduction of area about 35 per cent, and at minus 20° the impact strength was 29 ft-lb. At a low tempering temperature of 775° F, the tensile was about 215,000 psi, reduction of area about 15 per cent, and the impact strength at minus 20° was 8.5 ft-lb.

Structural Variables Influencing Mechanical Properties of High-Strength Cast Steels; a Progress Report by M. C. Flemings, H. F. Taylor, Massachusetts Institute of Technology, and Robert Green, Chapman Valve Mfg. Co., Indian Orchard, Mass. Presented by Mr. Green. From plate castings poured in a variety of molding materials with and without incorporation of chills to obtain a wide range of solidification conditions, it was found that they all exhibited predominantly columnar grains as the macrostructure. Microstructure was affected markedly, however, with fast cooling rates producing extremely fine structure within the austenite dendrites. Slower cooling resulted in a substantially coarser structure.

Radiographic examination showed plates free of macroscopic centerline shrinkage as well as in ⅛-in. sections cut from the plates. However, microradiography of sections 0.020 in. thick disclosed voids at or near the centerline of all plates examined. Amount and distribution of voids were dependent on mold material. Unchilled plate cast in silica sand exhibited the most severe porosity.

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Circle 697 on Page 53

Design Contest Sponsored by Gray Iron Founders' Society

Everybody wins a prize in the 1959 Design Contest sponsored by the Gray Iron Founders' Society. Deadline for contest entries is June 30.

Winner of the first prize award will receive $500, plus a citation at the society's annual meeting next October in San Francisco. The second-place award is $100 with a citation; the third through seventh prize, $50 plus a certificate of recognition. All bona fide entrants will be given a "Gray Iron Castings Idea File" which illustrates 26 typical cost-saving pointers in the application of gray and ductile iron castings.

Primary purpose of the annual competition is to give due recognition to designers, engineers, and buyers of gray iron castings. Anyone connected with the metalworking industry is eligible to enter the contest. Entries are judged on: 1. How the design, or redesign, did or could increase the efficiency of the product. 2. Cost savings. 3. The potential commercial importance to the gray iron industry as a whole. 4. Ingenuity of the design.

Official entry blanks and contest rules may be obtained from the Gray Iron Founders' Society, 930 National City-E. 6th Bldg., Cleveland 14, Ohio.

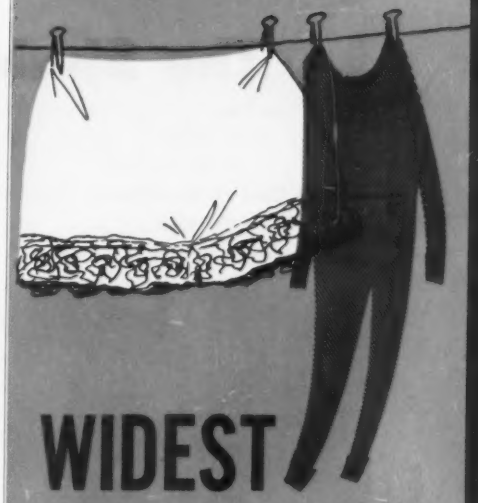
Foundry Career Opportunities Described in New FEF Booklet

The foundry industry and the opportunities it offers the young man for a career are described in a new booklet prepared and distributed by the Foundry Educational Foundation. It is entitled "Engineering and Technical Career Opportunities in the Cast Metals Industry."

The booklet tells briefly how castings are made and used, how to prepare for a career in cast metals, what the FEF is doing in foundry education, and cites examples of how FEF scholarship winners have progressed in the foundry industry. It is planned to distribute the booklet widely among pre-college students.

Expense of the booklet's preparation was borne by the Wheelabrator Corp.

Circle 698 on Page 53→



WIDEST APPLICATION

Whatever your cleaning job may be, there is a size and type of Malleabrasive shot or grit of a specialized hardness to do your job best.

Whether you use centrifugal or air-blast cleaning equipment—whether you want shot finish or grit finish—whether you clean steel, gray iron, malleable, bronze or aluminum, whether for cleaning before surface coating, enameling, metallizing, galvanizing, you can have in Malleabrasive the right type to do it best.

The full and complete Malleabrasive process—used by us exclusively—enables us to combine the toughness of malleable iron with various degrees of hardness to produce abrasive "tailored" to your special needs.

Our service personnel is available to consult with you without obligation. Write us.

THE GLOBE STEEL ABRASIVE CO.
Mansfield, Ohio

Sold by Pangborn Corp., Hagerstown, Md., and by many leading distributors of foundry supplies from coast to coast.

MALLEABRASIVE

The Shakeout

Mobile Unit Demonstrates Melting Furnace

ON-THE-SPOT, inplant demonstrations of the Revecon furnace made by International Foundry Supply

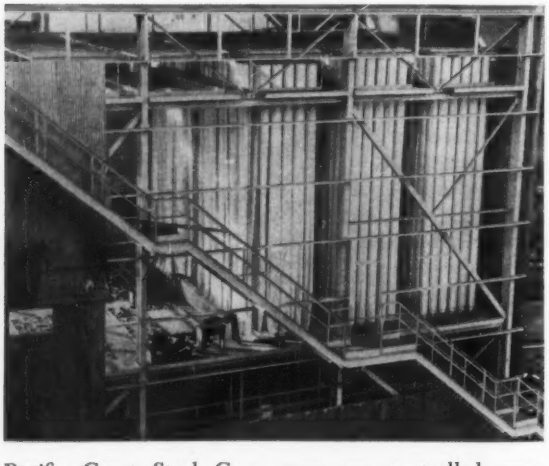
Co., Reading, Pa., are being presented for foundries in every state with this mobile demonstration unit. The unit is staffed by an engineer and a foundry technician who work with metal used by the foundry they are visiting.

They check the foundry's present installation for fuel consumption and metal loss in addition to showing how their furnace works and what results it produces. The mobile unit is completely self-contained and operates on either oil or gas.

For More Details Circle No. 517—Page 53

Collector Controls Electric Furnace Emissions

SMOKE AND SOOT from two 100-ton capacity electric arc furnaces at the Seattle plant of Bethlehem

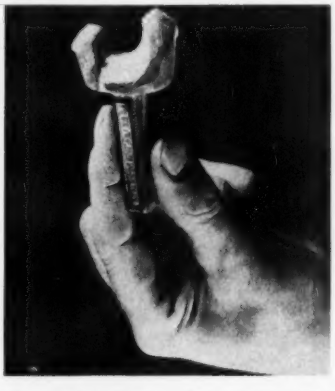


Pacific Coast Steel Corp. now are controlled completely by a recently installed Therm-O-Flex filter-type dust and fume collector. Made by Western Precipitation Corp., Los Angeles, the unit works like a vacuum cleaner.

It collects smoke and fumes in bags 25 ft long and 12 in. in diam. They are made of a silicone-treated, woven glass fabric and will withstand temperatures up to 550° F. The complete unit contains 792 bags in 12 groups of 66 each, all enclosed in a metal building called the bag house. Each bag is collapsed every half-hour, and material clinging to the bags drops of its own weight into hoppers below.

For More Details Circle No. 518—Page 53

Bit Drills through 2650 Feet of Salt



THE BIT shown here drilled through 2650 ft of salt at the Canadian Rock Salt Co.'s Ojibway mine, Ojibway, Ont., Canada. The previous record was 1450 ft, so that this bit chalked up an increase of 82 per cent. It also completed 46 holes before it had to be reground. The bit is called VL 1-¾-12 and is tipped with cemented carbide made by Carmet, the carbide-producing facility of Allegheny Ludlum Steel Corp., Pittsburgh.

For More Details Circle No. 519—Page 53

Silicone Rubber Insulates Electric Motors

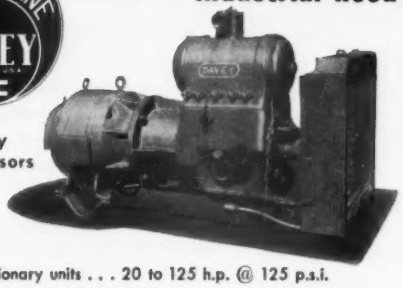
RESISTANCE of random-wound, open electric motors to abrasive and corrosive conditions created by dirt, dust, and fumes has been increased by a silicone rubber insulation developed by General Electric Co., Schenectady, N. Y. The insulation is a liquid which is forced through and around the stator windings at room temperature, then vulcanized to form an effective seal.

The treatment results in a thin, waterproof coating that bonds tightly, but still allows good heat transfer from the end turns to the ventilating air. The insulation is said to retain good flexibility and bonding properties in temperatures from −40° C to +200° C. It does not crack or break loose from the electrical parts, thus helping to prevent entry of moisture, dirt, or corrosive materials.

For More Details Circle No. 520—Page 53

HYDROVANE
DAVEY
KENT OHIO U.S.A.

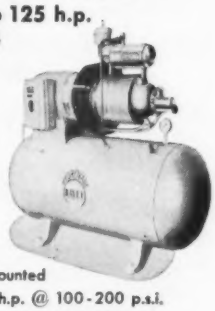
NEW... meets every industrial need!



Rotary Compressors

Stationary units . . . 20 to 125 h.p. @ 125 p.s.i.

- ✓ Silent . . . vibrationless . . . compact
- ✓ Complete line . . . 2 to 125 h.p. . . . 8 to 500 c.f.m. @ 125 p.s.i.
- ✓ No complicated engineering . . . no compressor room . . . no foundation
- ✓ Easy to install and operate
- ✓ Air cooled or water cooled



Tank mounted
2 to 5 h.p. @ 100-200 p.s.i.

Write for Bulletin M-132

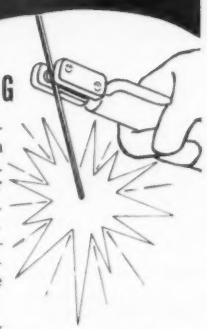
INDUSTRIAL DIVISION

DAVEY
pioneers of "air-cooled air"

DAVEY COMPRESSOR CO.
Kent, Ohio

Circle 699 on Page 53

BECKER
Keen-Cut Electrodes
for use in
CARBON ARC-AIR JET GOUGING



KEEN-CUTS—for the best characteristics of carbon and graphite in a carbon arc cutting electrode. Higher current capacity . . . longer life . . . shorter cutting time . . . greater material removal . . . smooth surface gouge . . . controllable accuracy . . . hot stable cutting arc . . . elimination of smoke and gases.

And they're low in cost. Try BECKER KEEN-CUT ELECTRODES—black or copper coated, standard diameters, 12" lengths in 150 to 1400 amp. range—for the most efficient, labor-saving electrode in carbon arc/compressed air cutting.

A COMPLETE LINE OF CARBON AND GRAPHITE WELDING SUPPLIES—carbon and graphite electrodes, carbon rods and plates, welding paste, graphite cores and chills, graphite powder and particles of any mesh.

Write for catalog.

BECKER BROTHERS CARBON CO.
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Telephone: BI 2-1260 • Chicago

Circle 700 on Page 53

NEW

DIAMOND FOUNDRY
SODA ASH
BRIQUETTES

for fast, efficient, desulphurizing action

No inactive ingredients to add to cost. Pillow shaped for easy handling and fast, efficient desulphurization of molten metal in cupola or ladle. Diamond Foundry Soda Ash Briquettes permit greater use of scrap metal in melting, release entrapped gases and increase fluidity. Tough, moisture-proof 100-lb. bags keep them dry, effective and safer to use.

For prompt shipment and technical assistance, call your nearest Diamond sales office.
Diamond Alkali Company, Cleveland 14, Ohio

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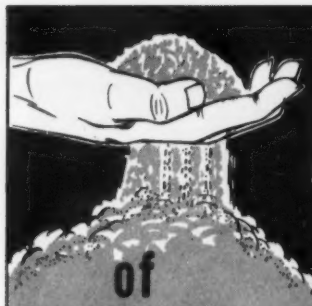
633 Penton Bldg. Cleveland 13, Ohio SUperior 1-8683	1006 Main St. Houston 2, Texas FAirfax 3-7329	99 Park Avenue New York 16, N. Y. OXford 7-0440

Diamond Chemicals

Circle 701 on Page 53



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Buy direct these two quality cellulose products at substantial savings from one of America's leading processors. No more large inventories or heavy freight charges for foundries within 200 miles of New York City.

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Precisely ground from corn cobs. Provides maximum flowability with uniform hardness — reduces scabs and buckles. Gives superior shakeout with increasing collapsibility.

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100% maple woodflour of uniform texture with controlled moisture content. Gives decreased hot strength at 1000° F. Substantially increases core-gas volume and green compression strength of sand.

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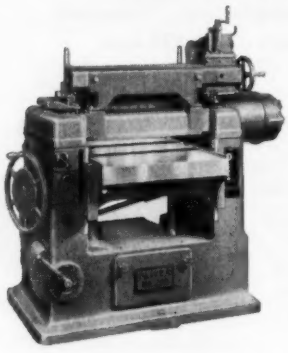
Circle 702 on Page 53

MIRROR SMOOTH PLANING!

"OLIVER" No. 299 — 24" Surfacer with speeds 15 to 60 f.p.m.

Planes stock up to 24" wide, 8" thick, as short as 11". Circular safety type cylinder, 3-knife standard, 4½" cutting circle. Sectional chipbreaker, sectional infeed roll and permanently located knife grinding and jointing attachment. All controls located in front of operator. Send for folder giving complete technical details.

OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN



"OLIVER" — *famous for Precision Machinery*

Circle 704 on Page 53

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EDWIN S. CARMAN, INC.

LEE ROAD AT MAYFIELD
CLEVELAND 18, OHIO

A COMPLETE FOUNDRY SERVICE

MECHANIZATION

Circle 703 on Page 53

NON-FERROUS FOUNDRY METALLURGY

By A. J. Murphy

Covers the general principles unifying foundry techniques of all industrial nonferrous metals in relation to metals in the liquid state to the process of solidification and to the factors influencing properties of casting. Other materials include the part played by gas dissolved in liquid metals, its control and its influence on cast products; factors influencing the grain size of castings, and mechanical properties of castings as complete components compared with the properties in conventional test samples.

497 pages — Price $12.50 Postpaid

FOUNDRY Book Dept.
1213 W. 3rd St., Cleveland 13, Ohio

Some of the Many Foundries utilizing Euclid Cranes . . .

Crucible Steel Casting Co.
Burnside Steel Casting Co.
Allyne-Ryan Foundry Co.
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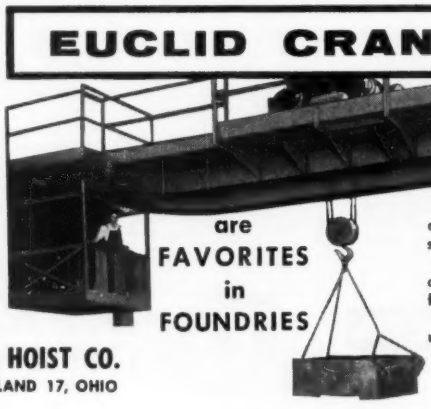
Columbiana Foundry
M. B. M. Foundry, Inc.
Kasper Foundry
Duplex Foundry
Larson Foundry
Alcoa Foundry
Interlake Iron Corp.
Texas Electric Steel Casting Co.

EUCLID CRANES



This 10-ton, 3 motor EUCLID CRANE is in operation at TEXAS ELECTRIC STEEL CASTING COMPANY

are FAVORITES in FOUNDRIES

EUCLID thinks, designs and builds foundry cranes with dust proof mechanisms that withstand abrasive, corrosive conditions.

Push-button, rope pendant floor control and overhead cab operation incorporate the latest design improvements for precise load control at all times.

EUCLID SERIES H HOISTS are available in capacities up to 10 tons.

Write for Latest Literature

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1360 CHARDON ROAD • CLEVELAND 17, OHIO

Circle 705 on Page 53

STOP! MISALIGNMENT USE VAN GORP *Turn-Clean* PULLEYS

DODGE TAPER-LOCK SIZES 8" to 60"

Van Gorp Self-Cleaning Pulleys are designed to stop costly, troublesome problems. Individual wing construction insures automatic positive cleaning action because rotation of the pulley discharges all foreign material to the sides of the pulley. No more abrasive belt wear! Conveyor belts are always properly aligned!

Rugged, all welded steel construction makes Van Gorp Pulleys durable and capable of top performance even under the most severe working conditions. BIG PULLEYS — up to 5 feet in diameter and 5½ feet in face width and a 10-inch maximum bore. Be wise, specify Van Gorp Self-Cleaning Pulleys. Write for FREE Catalog.

Van Gorp Mfg. Inc.

PELLA, IOWA

Circle 706 on Page 53

WELDMENTS to your order

Complete facilities to produce all types of welded constructions . . . carbon or stainless steel and aluminum from 1/16" to 4" thick . . . to your specifications.

This includes tanks, chutes, hoppers, machine bases, stacks, breechings, angle rings, special cars, buckets, and other equipment.

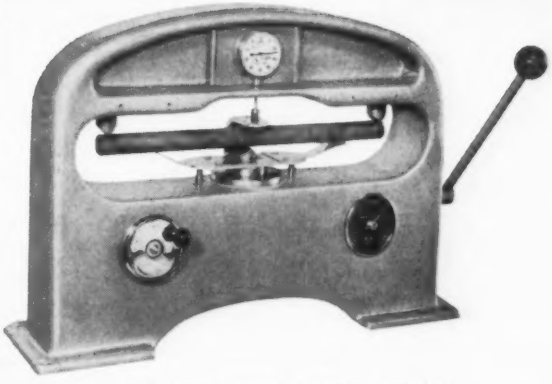
Call or write for estimate. Let us show you how we can save you time and money.

PENN IRON WORKS, INC.
READING, PA. Phone FRanklin 6-4826

Circle 707 on Page 53

FOUNDRYMEN!!

NOW...A 4 MINUTE GRAY IRON TEST



- Obtain accurate technical data on brittleness and strength as soon as test bar has cooled.
- Test data complies with Federal Specifications QQ-1-652.
- No experience necessary... no need to shield from factory dust.
- Tester is bench type, requires little space. Low in cost and trouble-free.

Send for folder
Write, wire or phone
for complete details

P·H·I PRESS

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Circle 708 on Page 53

CLASSIFIED ADVERTISING

Help Wanted

ENGINEER—MECHANICAL

For responsible job with fast growing firm in metals field. Must be experienced in stress, analysis design of process equipment. Metallurgical and centrifugal casting background desirable. Upper Great Lakes area.

BOX 500, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY DESIGNERS AND DRAFTSMEN

Large manufacturer with a number of gray, nodular, and malleable iron foundries in the Middle West has openings in its central engineering department for draftsmen and designers with experience in the design of foundry facilities, including sand processing and handling systems, molding equipment, cupolas, and other allied equipment and installations. Give detailed resume of experience, age, education, salary requirements, date available, and a recent picture in first letter.

BOX 485, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

METALLURGIST, FOUNDRY

Foundry metallurgist with B.S. degree, or equivalent technical knowledge, with experience in cast iron foundry operations. Must be capable of establishing controls for melting and supervising expanding metallurgical laboratory.
Should be interested in attractive, long-term opportunities with medium size manufacturer. Salary open depending on experience. Fringe benefits above average, with noncontributory surgical, hospitalization and profit sharing program.

BOX 510, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ACCOUNTANT WANTED

PROGRESSIVE STEEL CASTINGS FOUNDRY HAS OPENING FOR A STAFF ACCOUNTANT TO ASSIST CONTROLLER. APPLICANT MUST HAVE FOUNDRY EXPERIENCE IN STANDARD JOB AND PROCESS COST, BUDGETS, CREDITS AND COLLECTIONS, PREPARATION OF FINANCIAL STATEMENTS, INCENTIVE PLANS, AND SUPERVISION OF GENERAL ACCOUNTING FUNCTIONS. I.B.M. EXPERIENCE DESIRABLE. EXCELLENT OPPORTUNITY FOR FUTURE ADVANCEMENT WITH THIS MODERN FOUNDRY LOCATED IN THE MIDDLE WEST. SEND COMPLETE DETAILS OF EDUCATION AND EXPERIENCE, AND SALARY REQUIREMENTS. ADDRESS: BOX 490, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

FOUNDRY ENGINEER

Ohio Manufacturer has an opening for an aggressive young man with ferrous foundry experience. Must be capable of analyzing, recording, and solving problems involving scrap and process difficulties. Will have responsibility of recommending, carrying out and following through the changes required. Must have management potential. Furnish resume stating education, experience, and qualifications. Salary open. Address: Box 502, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER—GRADUATE

Needed by corrosion and heat-resistant alloy foundry in northern New Jersey. Assume full responsibility process development and control. Address: Box 505, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

PLANT ENGINEERS

Experienced on layout of all types of foundry equipment, material handling and material flows. Send complete details on work history, education and family status. Include recent photograph. All replies confidential.

BOX 509, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MOLDING SUPERVISOR

Progressive foundryman needed to assume complete responsibility for all molding operations, in Central Ohio firm producing gray iron, alloys, and ductile iron; minimum of 5 years' experience in supervision. Synthetic sand and incentive shop experience necessary. Castings to 5 tons. Good opportunity. All replies answered and confidential.

BOX 487, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ASSISTANT FOUNDRY METALLURGIST

Capable general supervisor with experience in acid and basic operations, for gray iron and ductile iron melting. Must have experience in cupola operations and knowledge of practical operation.
Opportunity for qualified man in progressive organization located in Wisconsin.
Write giving age, complete background and salary expected.

BOX 493, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

ASSISTANT PLANT SUPERINTENDENT

Well rounded foundry background for position with large East Coast malleable iron and steel foundry. Prefer man with metallurgical training. Should be capable to assume larger responsibilities. Must be able to handle people. Send resume, including education, experience and salary requirements; enclose photograph if possible.

BOX 499, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

FOUNDRY METALLURGICAL ENGINEER

Excellent opportunity for a young Metallurgist with a few years of experience in steel and alloy steel castings to become Assistant to the President. Must assist in technical problems and sales contacts. Fifty (50) man jobbing foundry, Detroit area. Furnish complete details including age, experience, education, salary desired and references. Address: Box 506, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

STEEL FOUNDRY MOLDING FOREMAN

To take charge of floor molders, rollover machine molders, squeezer molders, pouring crew and labor for molding department. Must have thorough knowledge of loose pattern molding, heading, gating and pouring. Send complete details, experience, health and salary requirement. Address: Box 519, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERVISOR—METALLURGIST

Midwest Bronze Foundry, pouring six to eight tons bearing alloys daily, needs man capable of directing part or all of molding, coremaking, melting, laboratory, and maintenance operations. Salary based on applicant's capacity to handle job. Address: Box 489, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Capable of running aluminum and bronze jobbing foundry—must be willing to work with newest processes—well established company—profit sharing plan. Address: Box 488, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Help Wanted

METALLURGIST, MAGNESIUM FOUNDRY

LARGE, LONG ESTABLISHED SOUTHERN CALIFORNIA MAGNESIUM SAND CASTING FOUNDRY WANTS QUALIFIED MAN WITH KNOWLEDGE OF GATING AND RISERING TECHNIQUES TO ASSIST IN THE PRODUCTION OF AIRCRAFT QUALITY MAGNESIUM SAND CASTINGS. SEND RESUME OF EXPERIENCE AND SALARY EXPECTED.

BOX 508, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

QUALITY AND SAND CONTROL TECHNICIAN

Experienced sand and related casting control technician is required in a gray iron mechanized jobbing foundry in Wisconsin for light to medium production work. Opportunity for qualified man in progressive organization.
Submit experience, education, age and salary expected.

BOX 498, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

OPPORTUNITY UNLIMITED

For college graduate with ferrous foundry experience. Age 28 to 40. Southeast Wisconsin. Particulars.

BOX 518, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

IRON FOUNDRY FOREMAN

Small modern job shop with slinger, needs versatile man to supervise molding and maintain sand control. West Coast. Send details. Address: Box 501, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

MANAGER

Preferably with a following knowing all phases of nonferrous business including CO_2, etc. State age, experience and salary expected. Address: Box 497, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Positions Wanted

MANAGER—SUPERINTENDENT

Technical and practical knowledge of all phases of ferrous and nonferrous jobbing and production foundries. Metallurgical background. 22 years supervisory experience. Good trouble shooter. Best of labor relations. Age 46, employed. Address: Box 511, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Thorough knowledge of all phases of nonferrous metals. Understand gating, jobbing, floor, machine and plumber supplies. Can also produce pressure tight and porous free castings. Know sand control and core room work. Address: Box 492, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY ENGINEER OR EXECUTIVE

Age 41, 20 years' experience in gray iron, malleable, brass foundries as an engineer, Superintendent and manager. Familiar with every phase of the foundry. Now employed but location unsatisfactory. Address: Box 486, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

POSITION WANTED

As a salesman, trouble shooter or manufacturers' agent for gray iron or semi-steel foundry in Western Michigan. Approximately 40 years of experience in all phases of foundry operations and as owner. Address: Box 512, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Widely experienced, free to relocate. Address: Box 517, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CLASSIFIED ADVERTISING

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FOUNDRY PERSONNEL SPECIALISTS

National Placement and Procurement of

GENERAL AND PLANT MANAGERS, PLANT SUPERINTENDENTS, FOREMEN—ALL DEPARTMENTS, METALLURGISTS, ENGINEERS, CONTROLLERS, ACCOUNTANTS, SALESMEN, SALES MANAGERS, PERSONNEL DIRECTORS, PURCHASING AGENTS

Confidential Inquiries Invited

From Employers and Qualified Applicants

For Fast Competent Assistance Contact

DRAKE PERSONNEL, INC. **FINANCIAL 6-8700**
JOHN COPE, DIRECTOR 29 E. MADISON ST., CHICAGO 2, ILL.

SALARIED PERSONNEL

$5,000-$30,000. This nation-wide service successful since 1927 finds openings in your field. Sells your abilities; arranges contacts. Present position protected. Write for details. Address: JIRA THAYER JENNINGS, P. O. BOX 674, MANCHESTER, VERMONT.

Positions Wanted

FOUNDRY EXECUTIVE

PRESENTLY EMPLOYED BY 100 TON PER DAY GRAY AND NODULAR IRON FOUNDRY AS ASSISTANT SALES MANAGER. SOUND TECHNICAL AND PRACTICAL BACKGROUND AS MOLDER, COREMAKER, ASSISTANT SUPERINTENDENT, CHIEF METALLURGIST AND RESEARCHER IN SHELL, CO_2, NODULAR, ETC. GOOD ADVERTISING AND CONTACT PROPOSAL EXPERIENCE. ADDRESS: BOX 494, FOUNDRY, PENTON BLDG., CLEVELAND 13, OHIO.

SUPERINTENDENT OR MANAGER

Practical foundryman, nationally known for a job well done. Age 46, good health, now employed. Looking for more action, ferrous or nonferrous. Address: Box 520, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM FOREMAN

Age 38, 20 years experience in the core room on iron and steel production and jobbing work. Desire job with future. Anywhere in Midwest. Address: Box 496, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

PERMANENT MOLD ENGINEER

Graduate Metallurgist with 25 years' experience in light metal castings. Handle all phases of engineering or supervise complete operation. Interested in process development. Address: Box 514, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOUNDRY CONTROLLER

Fifteen years' experience in ferrous foundries and heavy machinery. All phases of controls, systems, taxes, costs. Address: Box 495, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

SUPERINTENDENT

Practical and technical 30 years' experience jobbing and production. Familiar with every phase of the foundry. Now employed. Address: Box 515, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

CORE ROOM SUPERVISION

Thirty years in foundry, 20 years' core room supervision, both steel and gray iron, on blowers, bench, rollover and CO_2. Good labor relations. Address: Box 513, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Opportunity

PERMANENT MOLD METHOD AVAILABLE

THE WAGNER PERMANENT MOLD CO., 2910 Empire Ave., Burbank, California, has developed a Permanent Mold Method for ferrous and nonferrous metals and invites inquiries from any country regarding this method and process.

Foundry Consultants

HEVERLE & HAY

ENGINEERING—ACCOUNTING CONSULTANTS TO INDUSTRY

(Since 1907)

COST CONTROL—COST REDUCTION
FOUNDRY METHODS

121 NORTH BROAD STREET
PHILADELPHIA, PA.

FOUNDRY CONSULTANT—NONFERROUS

Sand — permanent mold — centrifugal permanent mold — and centrifuge permanent mold. High pressure castings a specialty. Address: ED JENKINS, 253—8th STREET, WEST PALM BEACH, FLORIDA, PHONE: TEMPLE 2-8685.

Open Capacity

NOTICE

Have extra fine-grinding capacity and will custom grind ores such as Iron, Manganese, Chrome, Zirconium, etc. to buyer's specifications.

Prefer inquiries for carload shipments.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PA.

Representatives Wanted

MANUFACTURERS' REPRESENTATIVES

A completely modern electric furnace foundry specializing in shell molding of high strength alloy iron castings and brass castings, desires to appoint manufacturers' representatives in Midwest and Middle Atlantic States. Foundry can meet exacting specifications for physical properties, chemical analysis and microstructure. Men now calling on industrial accounts who require good production quantities of small castings are urged to write. List all qualifications, experience, current principals, etc. No objection to other non-conflicting foundry lines. Address: Box 484, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Representatives Wanted

SALES REPRESENTATIVES

Here is an established competitively-priced line you can count on for a good income. Milward Alloys, a leading manufacturer with a strong reputation is now in the process of localizing many sales areas to give better service to customers and prospects from coast to coast. A considerable number of territories are open. We need men who will take them on, full or part time.

You may now be serving the trade or you may have foundry experience. Maybe you're retired with time on your hands. Regardless of your situation, you will be amply rewarded—because Milward's line is broad and in constant demand. Milward alloys cut foundry costs. Orders are promptly filled. That's why we have a substantial reorder business.

The Milward line includes: copper shot; phosphor copper and other powerful deoxidizers and degasifiers; aluminum bronze and manganese bronze hardeners and ingots; copper silicon, copper manganese, copper iron, copper aluminum and copper chrome alloys; nickel copper and nickel iron alloys; aluminum titanium, aluminum silicon, aluminum manganese, aluminum iron and aluminum copper and other alloys.

Phone or send us a letter describing the area or locality you can cover, whether full or part time, and tell us a little about yourself . . . your qualifications, experience, and when available. This may well be the connection you've been waiting for. Write or phone: Mr. David B. Milward, President. Phones: Lockport, N. Y. 4-0435, or Buffalo, N. Y. LUdlow 6425.

MILWARD ALLOYS, INC.
Lockport, N. Y.

FOUNDRY SALESMAN

Want experienced gray and ductile iron salesman for the Chicago Territory. Castings from 50 lbs. to 20 tons. State salary required. All inquiries will be held in strict confidence. Telephone contact regarding this position can be made by calling BIshop 7-4250 or send resumes to:

W. R. NEELY
HANSELL-ELCOCK COMPANY
485 WEST 23rd PLACE
CHICAGO 16, ILLINOIS

MANUFACTURERS' REPRESENTATIVES

Well established low-cost New England foundry with full facilities for manufacturing all sizes of high quality gray iron castings desires contact with men interested in selling foundry products. Have convenient facilities for casting brass and aluminum.

BOX 507, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

SALES REPRESENTATIVES

Sales representation wanted for large gray and ductile iron foundry producing castings from 50 lbs. to 20 tons. Present sales organization being expanded. Territories opened in Ohio, Indiana, Illinois and Wisconsin. Send replies to:

W. R. NEELY
HANSELL-ELCOCK COMPANY
485 WEST 23rd PLACE
CHICAGO 16, ILLINOIS

AGENTS WANTED

Distributors or Manufacturer's Agents. Several choice territories available to experienced foundry equipment salesmen or agencies interested in selling the world-famous HANSBERG CORE SHOOTER. Hansberg is the most successful coremaking machine of the last ten years and is better than competitively priced. More models than any other manufacturer in this bracket. New bench and floor models include semi- and fully-automatics, combination shooter-gassers, rollover-strippers, vacuum and pressure CO_2-gassers.

HANSBERG SHOOTERS, INCORPORATED
P.O. BOX 729
EVANSTON, ILLINOIS

CLASSIFIED ADVERTISING

Wanted-To-Buy

WANTED

One used BRI or Blastcrete Cupola Gun—1200# size.

BANNER IRON WORKS
1920 SOUTH KINGSHIGHWAY
ST. LOUIS 10, MISSOURI
PROSPECT 1-2010

WANTED

Used or broken Silicon Carbide Grinding Wheels of any kind or size, regardless of bond. Will pay $35.00 per ton.

UNION MINING COMPANY
2306 FIRST NATIONAL BANK BLDG.
PITTSBURGH 22, PENNSYLVANIA

WANTED TO PURCHASE

Heat treat furnace or homogenizing furnace. Please write complete description and details with offer, and advise location for inspection.

BOX 504, FOUNDRY
PENTON BLDG. CLEVELAND 13, OHIO

MIXER WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address: Box 578, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

WHEELABRATOR WANTED

36" x 42" or 42" x 48", with loader. State age, condition, owner history, serial number and price. Address: BARCLAY FOUNDRY, INC., 4239 WEST LINCOLN AVENUE, MILWAUKEE 46, WISCONSIN.

WANTED TO BUY

Two (2) Mold Machines—Davenport make, 40 AJS Jolt Pin Lift. Address: Box 491, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

Foundry For Sale

FOUNDRY FOR SALE

Gray Iron, 8 ton capacity. Central Wisconsin. Well equipped, ideal labor market. Sacrifice price and terms. We will provide work for a qualified foundryman. Address: Box 516, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

For Sale

SAND BLAST EQUIPMENT
SELL-BUY-TRADE
GUARANTEED MACHINES
TERMS: 3 YEARS TO PAY

$70,000 worth new Pangborn and Wheelabrator parts. Priced 25% less than list.

6' LF-14 Pangborn Table	$2200.00
9' LG-14 Pangborn Table	4500.00
6' LG-14 Pangborn Table	2500.00
4' LF—Pangborn Table	2500.00
Pangborn 14 GK Barrel	2500.00
Pangborn 8 x 8 Room	2800.00
Pangborn 53 EN2 Hand cabinet	325.00
Pangborn Auto Peening cabinet	1100.00
48 x 48 Wheelabrator Tum. w/loader	4500.00
42 x 48 Wheelabrator Tum. w/loader	2500.00
27 x 36 Wheelabrator Tum. w/loader	3000.00
15 x 20 Wheelabrator	1800.00
8' Wheelabrator Table Blast	2000.00
4' Wheelabrator Table Blast	2500.00
72" American Table Room	4800.00
14 LG5 Pangborn Rotoblast Multi-table 4/5—5' tables	9000.00
Pressure Tanks, all types	150.00 up
Vapor Blast cabinets	400.00

All types and sizes of Hand Cabinets, Dust Collectors, Pressure tanks, Rooms, Horizontal or vertical Tumbling Barrels and additional Sand Blast Equipment too numerous to mention.

DIAMOND SALES, INC.
5654 W. Jefferson
Detroit 9, Michigan
VI-3-6750

FOR SALE

1—Dextrex Degreaser with temperature controls, steam pressure regulator, 2 baskets, size 70" x 25" x 12". Purchased 1955, slightly used. Price $1200 total.

1—Rotary Lift Hoist. Model F5L2, purchased 1955, never used. Price $900.

1—PRE2 Ingersoll-Rand Air Compressor, 24 x 12½ x 14 stroke, 210 HP, 440 volt synchronous motor complete with excitor, Serial No. 40569-40570.

1—Type #25 Size 8000 CFH DX Surface Combustion Gas Generator purchased new in 1956. Price $5600.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

For Sale

FOR SALE

Fisher Furnaces #600 MNP
Fisher Furnaces #400 MNP
Campbell-Hausfeld Tilt Furnaces
Campbell-Hausfeld Stationary Furnaces
Stedman Core Crusher, Hammer Mill
Skip Hoist for 9½ Foot Cupola—complete
Osborn #405 Rollovers
Mold conveyor 268' long
Elevators
Belt Conveyors
Shakeouts
International Rollover RES
Milwaukee 163 Jolt Stripper
Champion JSL 12 Pin Lift, jolt
Osborn 710J, Pin Lift
Osborn 212J, Jolt Squeezers
Osborn 275J, Jolt Squeezers
Osborn 276J, Jolt Squeeze
International LSJ, Jolt Squeeze
International PJS, Jolt Squeeze
Milwaukee 104 Jolt Squeezers
Champion JS 108 Jolt Squeeze
Arcade 1008 Jolt Squeeze
Spo 110 Jolt Squeeze
International Rollover 2410 G portable
International Rollover 30 x 8 no jolt
J & J 610 rollover portable
International pin lifts
Davenport pin lifts
Osborn 559 pin lifts
Spo 506 jolt rollover, pin lift, draw
International Type R core rollover, hand
Swing Grinders
Royer sand preparators
B & P preparators
Blystone sand mixers
American Sand Cutters, Models M, A11, A1
Coleman core ovens
Grinders ½ hp to 25 hp
Disc grinders
Ladles from 50 to 10,000 lb.
Pouring Devices 500 lb. to 2000 lb.
Gyratory riddles
Monorail and bridges
Air Hoists 250 lb. to 10,000 lb.
Overhead chain conveyor #458, track, cri
Blowers-Centrifugal-positive-exhaust
Dust collectors all sizes

FLASKS
ALUMINUM
SLIP and POP
Sizes from 10" x 10" to 48" x 48"

JACKETS
Aluminum and Iron

STEEL FLASKS
Sizes from 10" x 15" to 9' x 9'

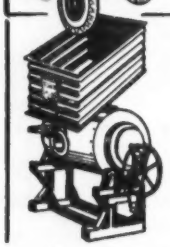
CORE PLATES
Transite——Iron——Aluminum

MANY OTHER ITEMS IN STOCK
SEND US YOUR INQUIRIES
WE BUY—SELL—TRADE

THE HOMAN MACHINERY CO.
710 E. FRONT ST. MAIN 10339
CINCINNATI 2, OHIO

EUCLID FOUNDRY & MACHINE EQUIPMENT CO.

14919 SARANAC ROAD — CLEVELAND 10, OHIO



DUST COLLECTOR
1—Whiting Hydro-Clone, wet type, 4,000 c.f.m.

WHEELABRATORS
1—20" x 27", 2 cu. ft. Tumblast
1—36" x 42", 11½ cu. ft. Tumblast, w/loader
1—42" x 48", 17½ cu. ft. Tumblast w/loader
1—4 ft. Tablast

MAGNESIUM CLEANING CABINETS
6—90" x 100" x 65" with exhausters, 8000 c.f.m.

MOLDING MACHINES (Automatic)
2—TDA4 Taccones

SAND SLINGERS
1—B-P Riddle type, 19" head, 4" tip
1—B-P Motive Jr., 19" head, 4" tip
1—B & P Dbl. Belt type, 19" head, 4" tip

SWING GRINDERS
10—10 H.P. Mummert-Dixon Model 1814
3—25 H.P. Safety Grinding Wheel Model 204

ELECTRIC FURNACE
1—350 lbs. Detroit Rocking

ASK FOR OUR COMPLETE LISTING — GLENVILLE 1-1222

Circle 871 on Page 53

CLASSIFIED ADVERTISING

For Sale

FOR SALE

Wheelabrator Tumblast, 20" x 27"	$2,500
Wheelabrator Cabinet, will handle work 3' x 8'	2,250
Tabor jolt rollover molding machine. Size of table 40" x 30"	1,000
275 Osborn portable molding machine	285
275 Osborn stationary molding machine	250
Climax Wire Cutter ¼-3/16	150
Pangborn EN2 cabinet	300
Tabor 10" molding machine	75
Pangborn dust collector, type CN 1000	950
American Rotoclone, sludge type, 2500 CFM	500
Uniwash dust collector, 5600 CFM, Newcomb-Detroit, 10 HP, 3/60/220 volts.	500
Magnesium deburring booth, Newcomb-Detroit, 4 position, 15 HP motor, blower	475
Flasks 48" x 48", 6" cope, 6" drag	
Flasks 52" x 48", 12 over 24	
Screenerator Model L	
Tabor 10" jolt pin stripper	225
Schram, 210 cu. ft. stationary air compressor	
Diesel driven V-belt	1,410

M. ELSTEIN
426 GRAND STREET
JERSEY CITY 2, N. J.

FOR SALE

1—Simpson #0 Muller—Style M (never used).
1—Lancaster Stainless Steel Counter - Current Batch Mixer, Type LW-62.
1—Lancaster Mixer, Model EBG-4.
1—Lancaster Mixer, Model EAG-3.
1—Ingersoll Rand Air Compressor, Type PRE-2. 24" x 16", 100# pressure with 300 HP motor.
3—Link Belt Roto - Louver Rotary Dryers, Models, 207-10; 310-16 and 502-20.

R. GELB & SONS, INC.
U. S. HIGHWAY 22, RAHWAY VALLEY R.R.
UNION, NEW JERSEY

For Sale

FOR SALE

Robins Floatex SSC Unit 5' x 6' 12,000# cap. New 1951
Hough HA Payloader, 1951, Rebuilt engine, pneumatic tires
Bondactor Gun, model 1000, complete with straight & rt. angle nozzles. New 1950
Jeffrey Vibrating Feeder 10' x 12' with 2.5 KW power supply, new 1950
Yale & Towne 3 Ton "Cable King" Hoist with pendant & trolley
Cleveland Tramrail Hoist (LoHed) 2 Ton cap.
Link Belt Steel Apron Conveyor 20' x 24' with Link Belt Speed Reducer & 5 HP TC motor for use under sand bin.
Chaplets, 4000# tinned steel, purchased from iron foundry that ceased operations, selling at 30% of list, min. order 100#

MEECH FOUNDRY, INC.
9906 MEECH AVENUE
CLEVELAND 5, OHIO
MICHIGAN 1-5550

REPAIR AND REBUILDING SERVICE ON ALL PNEUMATIC TOOLS

We try to carry a complete line of "Hard Chrome Rebuilt Tools" at about half the cost of new tools. Before you discard your old tools, why not send them to us for our estimate on the cost of renewing them with our Hard Chrome Process?

CENTRAL PNEUMATIC SERVICE COMPANY
512 LINDEN AVENUE
DAYTON 3, OHIO

For Sale

FOR SALE

OSBORN #559 Jolt Stripper (Never used, not even uncrated)
OSBORN Jolt Rollover Pattern Draw #242-5 (Good Condition)
INTERNATIONAL Type JDP (Twin Cylinder) Jolt Pin Lift (Rebuilt)
INTERNATIONAL Type GS Jolt Rollover Pattern Draw (Like New)
INTERNATIONAL Type F Jolt Rollover Pattern Draw (Like New)
TABOR Jolt Squeeze 8" Cylinder (Good operating condition)
HOUGH PAYLOADER Model HA-½ yd. (Completely rebuilt)
MOLD CONVEYOR (JEFFREY) w/drive (Good Buy)
CHAINOMATIC BALANCE 1/20th MG Sensitivity (Re-worked)
SPO #2136 Jolt Squeeze Pin Lift
Other good equipment—send us your inquiries.

W. O. McMAHON
BOX 5799, HOMEWOOD STATION
BIRMINGHAM 9, ALABAMA
PHONES: TRemont 1-2088 or 9-6170

FOR SALE

1—27" x 36" rubber belt Wheelabrator w/loader. May be inspected in operation.
1—Handy Sandy, twin hopper, Model HS-7-GT. Like new.
1—2000 lb. Hydroscale.
1—3250 cfm cupola blower, 20 HP motor.

BARCLAY FOUNDRY, INC.
4239 WEST LINCOLN
MILWAUKEE 46, WIS.

PUBLIC AUCTION

TUESDAY JUNE 16th at 10:30 A.M. D.S.T.

MODERN LATE TYPE GRAY IRON FOUNDRY

Formerly the property of South Bend Foundry Division of The Oliver Corporation, 533 South Chapin Street, South Bend, Indiana.
ONE OF AMERICA'S LARGEST FOUNDRIES

Air Compressor	Electric Hoists	Sand Systems
Charging Equipment	Flasks	#80 B&P Mullers
Coal Pulverizer	Grinders	Oscillating Conveyors
Core Blower	Hydraulic Press	No Leak Steel Slat Conveyors
Core Ovens	Material Handling Equipment	Molders Hopper Lines
Core Rollover	Molding Machine	Bucket Elevators
Cupola Blowers	Pattern Shop Equipment	Shakeouts
Dust Collector	Roller Conveyor	Misc. Small Tools, parts, & Supplies

INSPECTION BEGINNING June 8th from 9:00 a.m. to 4:30 p.m. Monday thru Friday until sale date.

WRITE • FREE CIRCULAR ON REQUEST • PHONE

NORMAN LEVY & CO., INC. AUCTIONEERS

100 West Monroe Street Chicago 3, Illinois DEarborn 2-4178

Circle 872 on Page 53

FOUNDRY LIQUIDATION

Formerly the Property of the Foundry Department of the Eberhard Mfg. Co., Cleveland

Consisting of two modern completely automatic molding systems, installed new in 1954. These two systems were used together with common sand hopper, elevator, shakeout, pan conveyor and air cooler; but can be sold separately. Each unit consists of the following:

Completely automatic molding system consisting of hoppers, Simpson 2F muller, Aerator, Cooling Hood, Charging Hoppers, Molders Hoppers, Spill Grate Hoppers, 8" Ajax Lo-Veyor, 12" Ajax Lo-Veyor, 36" Ajax Lo-Veyor, Hydro Filter, 4522 Molding Machine 4 Station, HA 500 Roll-Off Conveyor, HA 510 Drag Rockover, HA 520 Cope Conveyor Platform, HA 530 Drag Core Platform, HA 540 Closing Machine, HA 550 Closing Machine Push Out Cylinder, HA 560 Shuttle Transfer Machine, HA 570 Pour Platform, HA 580 Cooling Conveyor, HA 590 Mold Lift Machine, HA 600 Mold Transfer Machine, HA 610 Core-Strip-Drag Rockover Machine, HA 620 Automatic Shakeout Machine, HA 630 Drag Turn Machine, HA 640 Cope Turn Lift Machine, HA 650 Roll-On Conveyor, Cooling Conveyor, Osborn Drag Rockover, Cope Shakeout, etc.

Additional Equipment in Plant Consisting of:

5' x 12' Simplicity Screen
24" Magnetic Conveyor, Length 18'
Bucket Elevator 61' Centers, Buckets 16" x 8"
Sand Storage Bin 4500 Cu. Ft.
Dump Station 30" x 62"
Syntron Conveyor 24" x 60"
National Hydro-Filter Model HF 22, Cooling Unit
Ajax Lo-Veyor 24"
Whiting 7½ Ton, Overhead Crane, 50' Span, A. C., Cab Operated—Runways partially Covered.
Electric Clam Shell, 1½ Yard Capacity, D. C.
2 Cupolas, No. 7, with Swivel Skip Hoist, Scales, Blowers & Suppressors
Bondactor #1000
American Tumblast 27 x 36 with Skip Loader
Coleman Tower Core Oven, 36' High, Carriers 24" x 90", 3 Racks to each Carrier
Ingersoll-Rand Air Compressor Model XRE-9¼x12—15x12, with 100HP Motor—3/60/440 and Excitor
Ingersoll-Rand Air Compressor Model XRE, Imperial 10, 11x14—18x14, with 175 HP Motor 3/60/440 and Excitor
Ingersoll-Rand Air Compressor Model 30—3 x 1¾x2¾—2 HP 3/60/220/440
Towmotor LT 48, 108" Lift, 4000 Capacity
American Dust Collectors
Parsons Dust Collectors
Hough Payloader Model HA
7 Annealing Furnaces with Blowers
9 SPO Jolt Squeezers, Model 113
11 Osborn Jolt Squeezers, Model 275J
International Jolt Pin Lift, Model JDP
Osborn Jolt Stripper, Model 559
Magnet 55"
3 Demmler Core Blowers, Model 50
Demmler Core Blower, Model 2
Clearfield Muller No. 404
American Sand Cutter, Model M
Redford, Bench Type Core Blower
Pivot Type Belt Conveyor
Bucket Elevators
Air Receivers
Overhead Chain Conveyor, No. 458 Chain & Trolleys with Drive Unit
Ladles, Cylindrical and Tapered
Electric Hoists
Air Hoists
Core Plates, Transite & Asbestos
Tramrail
Barrel Type Casting Cans with Trunnions
Misc. Parts and Supplies
Roller Conveyor

This equipment may be seen by appointment only.

For inspection or further information contact:

EITHER—

ACME EQUIPMENT CO.
126 S. Clinton St.
Chicago, Illinois
Andover 3-3430

OR—

LIQUIDATION OFFICE
Eberhard Mfg. Co.
2734 Tennyson
Cleveland, Ohio
CE 1-8760

For Sale

FOR SALE

Pangborn Rotoblast Type ES-192, designed for cleaning of bath tubs. Unit complete with Schneible Collector, 825 gallon skim tank—two pumps. Blast cabinet 45' 6" x 11' 6". Seven rotors with 20 HP motors, 36 hooks on trolley conveyor—2 grit elevators, 6 separators. Spare parts inventory included. Unit offered on, as is—where is basis.

RHEEM-RICHMOND PLUMBING FIXTURES
DIV. RHEEM MANUFACTURING COMPANY
P. O. BOX 111
METUCHEN, NEW JERSEY
Attention: Purchasing Department

FOR SALE

1—46" x 76" Herman 6000# series charging conveyor type rollover and draw machine, complete with all clamps, vibrators, oil reservoirs, etc.
1—40" x 60" Herman heavy duty 15" solid cylinder jarring machine equipped with pattern stool and power lift conveyor.
1—Rollover Conveyor (rear discharge) with 4 auxiliary rolls.

AMERICAN HOIST & DERRICK COMPANY
63 SOUTH ROBERT STREET
ST. PAUL 7, MINNESOTA
Attention: R. M. Hansen

FOR SALE

MOTORS—GENERATORS
TRANSFORMERS
Unused—Rebuilt
WORLD'S LARGEST INVENTORY
ELECTRIC EQUIPMENT COMPANY
Phone station Collect GLenwood 3-6783
P. O. Box 51 — Rochester 1, New York

FOR SALE

1—#3 National Engineering Straight Lift Bucket Loader—35 cu. ft. capacity. Will lift and discharge 25 ft.

THE ANDREW TERRY COMPANY
TERRYVILLE, CONNECTICUT

FOR SALE

DETROIT ROCKING FURNACE

Type AA with cylindrical shell, 1200 lb. cold or 2600 lb. hot metal, complete with mechanical and electrical equipment, oil filled Kuhlman transformer, 11,000 volts primary, 125 volts secondary, 2800 amperes full load, installation drawings, unused and crated ten years. Ideal for alloy irons, brass or bronze. Price f.o.b. local cars $6,500.00. Address: HOPE ELECTRICAL PRODUCTS CO., 39 LONG AVENUE, HILLSIDE, N. J., ELIZABETH 4-7837.

FURNACES FOR SALE

Ten used heat treating furnaces and two 7-ton gantry cranes. Good condition, priced to sell. Address: BAER STEEL PRODUCTS, INC., BOX 1428, BOISE, IDAHO.

FOR SALE

SPO Model No. 9546 Jolt Squeeze Clamp Rollover Power Draw Machine. Good Condition. Address: Box 503, FOUNDRY, Penton Bldg., Cleveland 13, Ohio.

FOR SALE

1—Gas fired Johnson melting furnace, 13" pot. 165# die cast capacity. Used one week. Like new. First $75 takes it. Address: ACE AGENCY, GURNEY, WISCONSIN.

FOR SALE

Two Lindberg radiant fired electric furnaces complete with controls, 440 V. 50 KW. Address: ALUMINUM MATCH PLATE CORP., 1500 MILITARY ROAD, BUFFALO 17, NEW YORK.

THE ACME BARGAIN PAGE

AERATOR
NEWAYGO

AIR COMPRESSOR
6 x 7 INGERSOLL-RAND

BELTING
29" x 180' 24" x 152'
24" x 263' 24" x 120'

BLOWERS
INGERSOLL-RAND 13,000 cfm, 32 oz., 150 hp., 220 V
GE 10500 cfm., 20 oz., 85 hp., 220 V.
GE 7500 cfm., 20 oz., 89.6 hp., 220-440 V.
GE Centrifugal 6200 cfm., 24 oz., 58 hp. motor
NORTH AMERICAN 1050 cfm, 16 oz.
SPENCER 7350 cfm, 16 oz., 50 hp.
SPENCER 2250 cfm., 16 oz., 15 hp., 220 V.
SPENCER 270 cfm., 8 oz., 3 hp., 220-440 V.

CLEANING EQUIPMENT
Model 4836V-B VAPOR BLAST

CONVEYOR OVERHEAD CHAIN
1400' JERVIS B. WEBB and LINK-BELT #678 with trolleys 36" centers. 2-5 hp. Variable speed caterpillar drives, take-ups and turns.

CONVEYOR
17' BARBER GREEN Bucket Conveyor
30" x 25' Magnetic Belt Conveyor w/drives, 2 hp., 220-440 V.

CORE BLOWERS
DEMMLER #2, 20# cores
DEMMLER #2K, 20# cores
REDFORD Bench types, horizontal or vertical clamping
CB15 55# cores, Universal blow plate
C.B. 10 up to 12# cores, 4½" draw
DEMMLER #4 up to 250# cores
FEDERAL "SAN-BLO" CB 40
INTERNATIONAL SB15H, up to 150# cores. Hydraulic clamp and draw
INTERNATIONAL SB 13, up to 60# cores
INTERNATIONAL SB 12, medium sized cores
INTERNATIONAL SB 11, medium sized cores
6—OSBORN 193 up to 50# cores
OSBORN 2035-2 large sized cores

CORE GRINDERS
5—MILWAUKEE 70-9 & 70-12s
1—OWOSSO DE1-303 42" table

CORE OVENS
THERMONIC INDUCTION MODEL 1800A
5—DESPATCH, Gas Fired, 3 Drawer

CORE ROLLOVERS
INTERNATIONAL REDP Rollover 12" draw
B & P CR 20-10
SUTTER SP 500F

CRANES
P&H 3 TON Electric Traveling DC motors 50' span
270' Crane Runway and Supports
10 ton MILWAUKEE; 48' span, 220 V.

CUPOLA GUNS
1—BONDACTOR #1250
BONDACTOR #1000

DIE CASTING
2—LAKE ERIE 800 ton Aluminum 58" x 89" die plates; 9# shot

DUST COLLECTORS
PARSONS 40,000 cfm. cloth bag type
ROTO CLONE, Size 6, Wet Type, 3000 cfm

ELECTRIC MELTING FURNACES
SWINDELL 9' Dia. Top Charge cap. 3 ton steel 5 ton iron per hour, 3500 KVA 13800 volt transformer, complete in place

ELECTRIC MELTING FURNACES
SINGLE PHASE
1—DETROIT "LFA" 350# shell 13200 V.
1—DETROIT "LFC" 700# & 350# Tapered Shell 2300 V.

FLASK HOIST—ROLLER CONVEYOR
NATIONAL 24"; 8' long table

FURNACE TRANSFORMERS
1—"LECTROMELT" 800 KVA, 12000 V., 3 phase
1—WESTINGHOUSE 500 KVA, 11200 V., 3 phase
1—WESTINGHOUSE 2500 KVA, 13800 V., 3 phase

FURNACES NONFERROUS
CAMPBELL HAUSFELD Staty. pot type
1—HEVI-DUTY HD-181-S Pot type, Electric
2—400# FISHER Gas Fired Tilting Furnaces
4—600# FISHER Gas Fired Tilting Furnaces
1—600# FISHER Gas Fired Stationary Furnace
FISHER RB100 Gas Fired Crucible
3—CAMPBELL HAUSFELD Gas Fired 625# brass hand tilt
1000# STROMAN DC double dipout w/complete controls

GRINDERS, SNAG
FOX 24" x 2" Single Wheel 10 hp.
1—HAMMOND 24" x 2" x 12" 7½ hp., 220 V.
HAMMOND WR-2, 2 speed, 30" x 3" wheel

GRINDERS, SWING FRAME
MARSCHKE 24" x 3" x 12" 20 hp., 220 V.
U.S. 24" x 3" x 12" 15 hp., 220-440 V.
2—MARSCHKE 3 hp., 12" wheel
1—B&D 7½ hp.

GRINDERS, MISC.
U.S. #70 Combination 20" disc and 20" x 3" x 1½" wheel

HEAT TREATING FURNACES
HOLDEN #202 Electrode Type, Bright hardening annealing 1850°
LINDBERG 48" x 48" x 72" Elec., 1250°, box type.
BELLEVUE Gas Fired Annealing 20' x 48" x 18"
HAGAN Oil Fired Annealing 18'3" x 3'3" x 18" high

HOISTS
10 ton SHAW BOX electric hoist
4—INGERSOLL-RAND Air trolleys
1—500# INGERSOLL RAND LC-4
4—CLEVELAND 2000# Cab type hot metal carriers

LADLE MIXING
4000# Industrial, Insulated

MOLD BLOWER
TACCONE TD4 24" x 32" flask

MOLDING MACHINES JOLT SQUEEZE PIN LIFT
3—#165-6B MILWAUKEE table, 24" x 30"
2—OSBORN 712 PJ, 18" x 21" table
1—CHAMPION JSL10P 18" x 21" table 6" draw
2—#2114 G. SPO table, 26" x 27"—11" cyl.
2—OSBORN 712 PV
MILWAUKEE #3548-6; 48" x 44" Tbl.; 12" Draw
MILWAUKEE #2542-3; 38" x 42" Tbl.; 12" Draw

SPECIAL! FACTORY REBUILDING
8—MILWAUKEE 2646 Jolt Squeeze Strip rolloff — rolling molding machines 10" jolt cylinder; 1800# capacity, 28" Squeeze cylinder; 13" draw, Flask size 25½" to 29" wide, 52" long. New 1951. WILL BE FACTORY REBUILT.

JOLT SQUEEZERS
2—INTERNATIONAL, LJS12 16" x 20" table
4—CHAMPION, JS10P 18" x 21" table
2—OSBORN 275PJ
MILWAUKEE 214—Jolt Squeeze car type
2—MILWAUKEE 244 Jolt Squeeze car type head

JOLT ROLLOVER DRAWS
1020 JOHNSTON & JENNINGS, 60" x 80" table
JOHNSTON & JENNINGS 918, 44" x 64" table, 20" draw, rollout table
1—1500# HERMAN 26" x 48"
2—750# HERMAN 20" x 30" table
1—INTERNATIONAL RJ 20" x 42"
3—SPO 9032

JOLT PIN LIFTS
2—INTERNATIONAL 1200-8 28" x 27" table, 8" draw

PIN LIFT PUSHOFF
CHAMPION 28" x 42" table
MILWAUKEE 620ND 20" x 24" table

MULLERS and MIXERS
2—#1 SIMPSON Mullers
B & P #30 w/skip loader; multrol heating, cooling blower.

SAND CUTTERS
1—ROYER MCZ-43

SAND SLINGERS
1—B&P Tractor, 19" heads
B&P 2 speed 40/25 hp. double belt

SAND SYSTEMS
2—NEWAYGO SUPER HANDY SANDY; like new

SAWS, BAND
30" LAIDLAW, Metal Cutting hydraulic feed
42" TANNEWITZ, 5 hp., 220-440 V.

SAWS, CUTOFF
DELTA Abrasive cutoff

SCALE
FAIRBANKS PRINTOMATIC 6250#

SHAKEOUTS
3' x 5' ROBBINS
3' x 5' SIMPLICITY
5' x 6' SIMPLICITY
4' x 10' SIMPLICITY

SHOT BLAST
SLY #4, 20" x 20" w/dust collector

SPRUE CUTTERS
2—PERKINS #53 1¼" stroke
1—MILWAUKEE #85 TON

TESTING EQUIPMENT
ARLIN Automatic Rockwell, continuous type
COLEMAN 55 Spectrophotometer
TYLER ROTAP Testing Sieve w/screens

TUMBLING BARRELS
1—ROYERSFORD, 42" x 72", chain drive, late
WHITING 60" x 72" 20 hp. drive
SLY 42" x 42" x 64" 10 hp.
SLY, 24" x 42"; 3 H.P.

WHEELABRATORS
1—42" x 48" AMERICAN Skip Loader.
AMERICAN #2 T blast S-29" tubes, late
2—HOLLINGSWORTH 44" x 48" Wheelabrators

WOODWORKING—PATTERNSHOP
GARDNER 30" DISC and Spindle Sander
JONES SUPERIOR 48" Double Disc
OLIVER 72DR Router or borer
BOICE CRANE 12" Planer
2—OLIVER 18ZD, 15" Disc Sanders
1—WALLACE 8" Jointer
1—CRESCENT 24" Planer
TANNEWITZ 42" Band Saw
ONSRUD W-244 & W-240 Routers
GREENLEE #495-S Tilting Arbor Saw
8", 12" and 30" Jointers
16", 32", 36" Band Saws

WIRE STRAIGHTENERS
2—#2A CLIMAX ¼"

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AIR COMPRESSORS
COMPLETE STOCK — BURY, PENNSYLVANIA, SULLIVAN, INGERSOLL-RAND —SEND YOUR REQUIREMENTS

BLOWERS
25—CENTRIFUGAL 16 oz., 2 to 5 HP
10—GE, WILBRAHAM - GREEN, FISHER Positive Pressure & Cent. Cupola Blowers

CLEANING EQUIPMENT & TUMBLING BARRELS
1—15" x 20" WHEELABRATOR Tumblast
1—20" x 27" WHEELABRATOR Tumblast
2—27" x 36" WHEELABRATOR Tumblast, one rubber belt, one steel conveyor
1—36" x 42" WHEELABRATOR Tumblast
1—48" x 42" WHEELABRATOR Tumblast,
1—48" WHEELABRATOR Swing Table
2—1-A WHEELABRATOR Multi-table with 6—26" aux. tables, 10—15" aux. tables
1—PANGBORN TABLAST, 8' Table, 2500 #
1—SLY, Twin Unit, 40" x 24" Round, 10 HP
1—SLY, 68" x 32" Round
4—SLY, 48" x 36" Round

CONVEYORS
1—JEFFREY Car Type Mold, 23 cars, 109' track, cars 34" x 50"
1—HEWITT-ROBBINS Vibrating, 18" W x 10' L, Model VC-I
1—JEFFREY Ingot Mold, 3 compartment type 60' centers
1—LINK-BELT, CAR type mold, 114 cars, 403' track, car size 18" x 42"
1—SIMPLICITY, 24" x 10" Feeder w/hopper, Model OA-10-JA2

CORE BLOWERS
10—DEMMLER #1, #2, #2A, #3K, #4E
3—INTERNATIONAL SB-13
3—OSBORN #91, #192, #91-10
1—RANDALL MODEL "A," Bench Type
1—TACCONE #4D, 10" Draw Stroke Cyl.

CUPOLAS
1—SKIP CHARGER for #9 Cupola with scale and buckets
1—WHITING Skip Charger for #5 Cupola
2—WHITING #7, 7 ton cap. Never used. Fraction of cost!

DUST COLLECTORS
10—ROTOCLONE #12, Type N, #14D, #16W, #20D, #24W, #30W

FURNACES—DIRECT ARC MELTING
1—250 lb. LECTROMELT, Side Charge
1—2000 lb. HEROULT, 3/60, 800 KVA
1—1¼ Ton HEROULT
1—3 Ton LECTROMELT, Door Charge
1—3 Ton SWINDELL Hyd. Top Charge, 3000 KVA Transformer, Latest Type

FURNACES—INDIRECT ARC
1—350# DETROIT LFA
1—750# DETROIT LFY, Conical Shell
1—1000# DETROIT AA, 300 KVA
1—3000# Detroit C, 500 KVA

FURNACES—INDUCTION MELTING
1—3 KW, AJAX, Lab type, steel
1—35 KVA, AJAX SPARK GAP, High Freq., steel
1—75 KVA AJAX, 2000# Brass
1—50 KW GECO, Steel

REBUILT & GUARANTEED

BEARDSLEY & PIPER

#70 Speedmuller

15 cu. ft. batch with Cooling and Skip Loader

FURNACES—GAS & OIL
1—225# Gas, hand tilt.
1—400# FISHER MNP, Gas Fired, Alum.
1—1000# STROMAN, Gas, Alum., hyd. tilt.
1—600# STROMAN, Gas, "U" Type
1—1200# Brass, MNP, Oil

FURNACES—HEAT TREAT
1—2' x 3' x 6', gas fired, 1800° F.
1—4' x 4' x 10' Gas Fired Annealing
1—9' x 12' Car Type, gas/oil
1—20" x 36" L&N Draw electric
1—32" x 78" L&N Vapocarb, 83 KW
1—10" x 24" x 60" Gas, double end doors

MOLDING MACHINES
Jolt Rollover Pattern Draw
1—HERMAN 10,000#, 48" x 109" table
1—HERMAN 6000#, 42" x 78"
1—HERMAN 3000#, 30" x 66" table
5—HERMAN 1500# to 30" x 48" tables
3—HERMAN 750# to 30" x 36" tables
2—INTERNATIONAL, 13" x 17" tables
1—J & J #1020, 50" x 60" table, 20" draw
2—J & J #815RB, 30" x 40" table, 1200#
1—OSBORN #602, 36" x 26", 900#
1—OSBORN #405, 3000#, flask size 64" x 57", 26" draw
1—OSBORN #42, 15" x 20", hand draw
4—TABOR 40" x 60", 1500 & 3000# capacity
2—TABOR 30" x 40" w/air clamps, 1000#
1—TABOR 22" x 42", pattern draw, shockless, portable, 600#
1—TABOR 20" x 30", w/air clamps, 1000#
2—TABOR 14" x 16" Rockover, 150#

Plain Jolt
2—DAVENPORT, table sizes 24" x 27", 30" x 30". 1200# to 1800#
1—INTERNATIONAL, 3' x 4' table, 12" cylinder

Jolt Pin Lift
1—HERMAN #4317, 22" x 30" table
1—J & J #681-C, 30" x 25" table, 600#
1—MILWAUKEE #1536, 32" x 38", 1500#
1—OSBORN #559, 25" x 30" table, 6" draw, 1200#
2—SPO #305, 750 lb., 20" x 27" table
1—TABOR 17" x 20" table, portable
1—TABOR 20" x 24" table, 600#

Jolt Squeeze Pin Lift
2—INTERNATIONAL PKL, 18" x 24" table, 12" sq., 5½" draw, stat.
1—MILWAUKEE #126, 21" x 27" table, 12" sq., 1200#, 8" draw
2—MILWAUKEE #163, 15" x 24" table, 11" sq., 1500#
2—MILWAUKEE #165, 24" x 30" table, 16" squeeze, 1700#
5—OSBORN #712J, #712PJ, 18" x 28" table, 12" sq., 6" draw, stat. & port.
5—SPO #2114P, 21" x 27" table, 600#
5—SPO #2136G, 21" x 30" table, 800#

Jolt Squeezers
2—INTERNATIONAL #12 LJS, 16" x 20" table
4—INTERNATIONAL #10 LJS, 16" x 20"
1—NICHOLS #12 F-P, portable, 600#
31—OSBORN #275PJ, #275J, 17" x 20" tables, 10" sq., 400#, stat. & port.
1—OSBORN #276J, 17" x 26" table, 13" squeeze, 500# port.
2—SPO #110J, 17" x 20" table port.
1—SPO #113 J, 18½" x 26" table, 13" cyl., port.

MATERIALS HANDLING
1—BYERS, Mobile Crane, BUDA Engine, 50' Boom, 5 ton w/magnet & bucket
1—HOUGH PAYLOADER, Model HA, 1000# cap., hyd. lift, mech. dump

MULLERS AND MIXERS
1—B & P #70 Speedmullor, 15 cu ft batch with cooling and skip loader
1—B & P, Conventional, SIMPSON type, 87½" Dia. arranged for cooling
1—CLEARFIELD #404, 4' Dia, 4 cu ft batch
5—SIMPSON #0, U.D. 3' Dia, never used
1—SIMPSON #1, U.D., 4' dia., 4 cu. ft. batch
1—SIMPSON #2, 6' U.D. Dia, 14 cu ft batch
1—SIMPSON #3, 8' Dia. Open Gear, 20-25 cu ft batch

LADLES AND POURING DEVICES
Bottom Pour
2—MODERN Crane Type, 55" H x 50" top
1—MODERN Crane Type, 60" H x 60" top
Lip Pour
1—WHITING 40" x 40" top dia. geared
1—WHITING 36" x 36", enclosed gearing
Cylindrical
8—WHITING, 26" L x 25" dia, 1100# iron
7—WHITING, 19" L x 22" dia, 600# iron
3—WHITING, 38" L x 28" dia, 2200# iron
Pouring Devices
11—WHITING, 650# to 2000# gross cap.

OVENS
1—COLEMAN Oil, 1 compartment, 14'6" L x 80" H x 5' W
1—COLEMAN, Oil, Drawer Type, 70" L x 57" H x 48" W
1—COLEMAN, Gas, 2 Comp. and 5 drawers, O.D. 22" x 12' x 10'
1—COLEMAN, Gas, 2 compartments, rack type, each compartment: 7' H x 8' W x 10' D
1—GENRICH, Elec., 3 drawer, preheating, auto-control, 9' H x 8' W x 6'7" L
1—GENRICH, Electric, Rack Type, 7' W x 7' H x 5'2" L
1—PORBECK, oil, 5 drawer core oven
2—ROSS, Gas, 2 compartment, recirc., rack type, 6½' x 14' x 7'

SAND CONDITIONING
1—B & P Nite-Gang
2—B & P Screenarator, Model "8" & "M"
1—JEFFREY Sanditioner, Portable, 10-15 tons/hour, 2 H.P. Motor
1—LINK-BELT Revivifier
2—ROYER, NC-2, 10-15 tons/hr, 1½ HP
1—ROYER PREPARATOR, Comb. Model NDC, 25 ton/hr scrap removal, 8' x 8' hopper
3—ROYERS, NDP, 15-25 tons/hr, 2 Hp

SAND CUTTERS
1—AMERICAN, 15 HP, 96/78 Reel
1—AMERICAN, 10 HP 48" Reel

SAND SLINGERS
1—B&P Stationary, Single Speed
2—B&P Tractor Type, 16" head

SHAKEOUTS AND SCREENS
1—ROBINS Vibrating Screen, 36" x 78"
1—SIMPLICITY 50" x 116" shakeout
1—SIMPLICITY Vibrex screen, 3' x 8'

TESTING EQUIPMENT
1—500,000 lb. TINIUS OLSEN Hydraulic Compression Testing Machine
1—GOGAN Hand Operated Brinnel Hardness Tester

MISCELLANEOUS
1—HOWE WEIGHTOGRAPH SCALE, Model 1700
1—KANE & ROACH WIRE STRAIGHTENER Model DX-5
FLASKS, CORE PLATES, All Sizes
1—CLIMAX Model 2-A Wire Straightener
10 or 15 HP GRINDERS, Swing Frame
8—GRINDERS, Dougle End, Pedestal Type, U. S., Cin., Gardner, 5, 7½ & 10 HP

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AIR COMPRESSORS

1—AMERICAN Size 9 x 9, horiz. w/30 hp.
1—KELLOG Model 350TV—5½ x 5", air cooled, 10 HP.

AIR & ELECTRIC HOISTS

85—I & R Air Motor type, sizes LC3, A, B, C, D, D-6 & E, 300, ½, 1, 2, 3 & 5 ton.
15—DETROIT Air Hoists, 1, 1½, 5ton cap.
2—P&H and DETROIT Model LHR, 5 ton.
20—THOR air hoists, ½, 1 & 2 ton cap.
1—SHAW BOX 2 ton load lifter.

BUCKET ELEVATORS

12—LINK-BELT & JEFFREY, 30, 40 50, 60 ft. cc, 10 x 7, 12 x 7, 14 x 7, 16 x 8 buckets.

CUT-OFF MACHINES

2—AMERICAN H-Rod Straighteners.
1—TABOR C10AF, 16" wheel, 10 HP.
3—TESSEMER H & I Sprue Cutters.

CORE BLOWERS

3—CHAMPION Model CB-10, CB-18, & CB-400. From 10 to 300 lb. Cores.
22—DEMMLER Model 1, 1E, 2, 2E, 2K, 3, 3E, 3K, 4 & 4E, 10 to 100 lb. Cores.
1—FEDERAL 40P-1 San-Blo.
7—INTERNATIONAL Model SB-11 & SB-13, SB-15H, 15 to 30 lb. Cores.
6—OSBORN Nos. 91, 92, 192 and 193. From 10 lb. to 75 lb. Cores.
3—MILWAUKEE #3A Bench Type.
1—SAN-BLO Model CB-40-B, 40# Cores.
1—SPO Model SC-10-DM, hollow core.

CORE OVENS

1—INDUSTRIAL "Revolving Carriers" continuous, 18" x 80" trays.
1—THERMONIC Model M800A Dielectric. Cap. 900#s per hour.

CUPOLAS, BLOWERS & EQUIP.

1—SPENCER 150 HP 7500 CFM 48 oz.
6—I & R Centrifugal 30, 50, 85 and 100 HP. 3500 to 10,500 CFM w/blast gates.
1—MODERN No. 3½ Cupola.
1—CUPOLA Bondactor, style 1205-L.
1—WHITING No. 6 Cupola.

ROTO-CLONES WET TYPE

9—AMERICAN AIR FILTER Type N&W, Sizes No. 20, 24, 27, & No. 30, w/sludge ejectors, cap. to 30,000 CFM.

ELECTRIC MELTING FURNACES

1—TOCCO 20 KW Induction, 9600 cycles.
3—AJAX No. 100 & 300 Furnaces Only.
1—DETROIT Size CM — 4000# Cold Charge, 8000# Molten Metal, w/1000 KVA transformer.
1—DETROIT AA, 750# Cold Charge, 1500# molten w/400 KW transformer.
1—AJAX 50KW M.G. Set w/Furnaces—3000 cycle.
2—AJAX 20 KW Hi Frequency Converters.
1—TOCCO 75KW M.G. Set—9600 cycles.

GAS & OIL FIRED FURNACES

23—LINDBERG FISHER Model MNP electric Tilt. Sizes 150, 400, 600, 1000, 1700, 2000 & 2400#, alum. cap. Gas or Oil.
29—LINDBERG & HAUSFELD Stationary, Sizes 100, 150, 200 & 550 cap.
1—LINDBERG #400 BBI hand tilt.
1—LINDBERG #300, ATH, hand tilt.
1—SKLEENAR 1200# Rev., hand tilt.
1—MONARCH 600# Rev., hand tilt.
1—STROMAN, Model "U" 600# Reverberatory Hand Tilt.
1—STROMAN DC "Dipout" 800# cap.
1—ECLIPSE E1000—Double Chamber Dry Hearth 1000# cap.

HEAT TREAT FURNACES

Complete line of used and rebuilt furnaces—gas, electric and induction, box pit-type, conveyorized, carburizing, nitriding, drawing, etc. Send us your requirements.

GRINDERS

Swing Frame

1—MARSCHKE 20" x 10" wheel, 10 HP.
2—FOX No. 6, 24" x 10", 15 HP.
3—MARSCHKE 24" x 3" wheel, 15 HP.
2—U. S. ELEC. Model 24, wheel 24" x 3".
1—MUMMERT-DIXON #2420, wheel 24" x 3".

Snagging

2—U. S. #64, 20" x 3", 7½ HP, 4 speed.
2—SAFETY #174, 24" x 3" wheel, 10 HP.
2—MARSCHKE 24" x 4" wheel, 20 HP.
1—U. S. #65, 30" x 3", 30 HP, 4 speed.
3—U. S. No. 62VS, 24" wheel, 2-7½ HP motor, variable speed.

Core

2—MILWAUKEE 70-12, 70" dia. table.
1—STONEY Core Grinder, 16" dia. Wheel.

Horizontal Disc

GARDNER No. 124—53" wheel, 20 HP.
GARDNER No. 179, 70" dia. wheel, 40 HP.

LADLES

17—MODERN & WHITING Cylindrical Ladles, 275, 1500, 2450, & 3000 lbs. capacity. All Enclosed Gears.
37—MODERN & WHITING Lip Pour, Enclosed Gear, 1200, 1600, 2000, 4000, 6000, 7000, 8000 lbs. capacity.
7—MODERN & WHITING Mixing Ladles, 2 & 3 ton. Electric & Manual Tilting.

NATIONAL ENGINEERING CO.

2-ton sand reclamation system used to reclaim old sand to a new supply. Operated pneumatically with turbine-blower. In use 2 years. Can be inspected. Still installed.

MOLDING MACHINES

Jolt Squeezers

37—OSBORN, SPO, MILWAUKEE, Portable & Stationary. 10" Squeeze Cyl.
13—OSBORN, MILWAUKEE & SPO Portable & Stationary, 12" Cylinder.

Plain Jolt

1—J&J 50 x 72 Table—5000# cap.
2—OSBORN 60" x 72" table, 6000# cap.
1—TABOR 36" x 36" table, 1000# cap.

Jolt Rollover Pattern Draw

1—DAVENPORT 28A, 28" x 44" table.
1—DAVENPORT 28-SA, 29" x 40" table.
1—DAVENPORT #24SA, 24" x 40" table.
3—HERMAN 1500 lb. Series, 26" x 48".
1—HERMAN 750 lb. Series, 20" x 30".
2—HERMAN 4000 lb. Series, 40" x 60".
14—INTERNATIONAL TYPE G, Sizes 20" x 8", 24" x 10", and 30" x 8".
2—J&J #612, 24" x 30" Table.
4—J&J #918, 44" x 54" Table.
1—J&J #815-B, 30" x 40" Table.
1—MILWAUKEE #167, 32" x 33" Table.
10—OSBORN #40 and 42 Core Rollovers.
1—OSBORN #442, 21" x 31" Table.
2—OSBORN #242W, 29" x 42" Table.
12—OSBORN #601 & 602, 30" & 36" Wide Flask, 10" draw, 750 lbs Cap.
2—OSBORN 643 Table 35" x 50"—2000#.
1—SPO #413D, 24" x 25" Table.
1—SPO Model 508, table size 28" x 30".
1—SPO 506—24" x 30" Table 10" Draw.
1—SPO 5050, Table 25" x 30", 10" draw
3—TABOR 30" x 40" Table, 12" Draw.
4—TABOR 22" x 42" table, 10" Draw.

Jolt Pin Lift

1—DAVENPORT 34AJS, 34" x 48" Table.
3—INTERNATIONAL JDP 1600 x 10" draw, 36" x 36" Table.
2—J & J No. 68S, 25 x 30 Table.
2—OSBORN #559, 25" x 30" Table.
2—MILWAUKEE #2542, 38" x 42" Table.
1—SPO #3058, 22" x 28" Table.
2—SPO #3070, Table 26" x 35".
1—TABOR, 22" x 32" table.

Pin Lift

2—B & P Model AL 2428 Speed Draw.
1—MILWAUKEE #620 ND Power Push Off.

Jolt Squeeze Pin Lift

1—MILWAUKEE #125, 21" x 27" Table.
3—MILWAUKEE No. 165, 24" x 30" table.
3—MILWAUKEE #196, 17" x 38" Table.
1—OSBORN #712-V, 18" x 26" Table.
2—OSBORN #710-J, 17" x 21" Table.
9—OSBORN 714PJ, 20" x 31" Tables.
1—OSBORN 716PV, Table 22" x 34", 16" cyl.
4—INTERNATIONAL PKL, 17" x 26".
1—INTERNATIONAL PK-20, Size 20" x 8".
2—SPO 2192-R, 24" x 40" table, 19" cyl.
2—SPO 2114P, Table 21" x 27", 11" cyl.
2—SPO 2160-R, Table 24" x 30", 16" cyl.

Shell Molding

1—SHALCO, Model HO4, 2 station.

CONVEYORS

Steel Apron

9—JEFFREY & LINK-BELT 24", 30", 36", widths. Lengths built to your specifications, with reducers & motors.

Oscillating & Vibrating

1—LINK-BELT 48" x 154', 20 HP Motor.
7—JEFFREY TAYLOR No. 5 Vibrating Feeders 24" wide x 7'.
LINK-BELT "FLEXMOUNT"
1—8" W x 50' L x 4" deep pan
1—12" W x 21' L x 4" deep pan
1—12" W x 26' L x 4" deep pan
2—18" W x 18' L x 4" deep pan

Roller

2500' MATHEWS 6", 12", 18" wide, 2⅞" dia. roller, 1¼" hex shaft, 4" channel.
1500—MATHEWS 8" x 12" wide, 3½" dia. 1" hex shaft on 6" centers, 6" channel.

Mold

1—DUO-ROLL 88 Cars 20" x 48", 350' track, with automatic dumping.

Belt

LINK-BELT & JEFFREY 18", 24" & 30" wide. Flat or trough idlers, all Timken bearings. Built to your specifications. Can be equipped with molders hoppers & Ploughs.

HOPPERS & STORAGE BINS

7—NATIONAL & LINK-BELT Storage Bins, 60 to 150 tons cap.
1—NEWAYGO HS-7-GT, Handy Sandy.
42—MOLDERS Hoppers 1½ ton cap.

SAND MULLERS

1—B & P #60, Speed Muller, 12 cu ft.
2—B & P #70, Speed Mullers, 18 cu ft.
1—BESSER Paddle Type, 30 cu. ft.
1—CINCINNATI 24" muller.
2—CLEARFIELD No. 610 w/skip hoist loaders, 10 to 14 cu ft batch.
1—CLEARFIELD #404, 4 cu. ft. batch.
1—DRAVO-DOYLE 6 cu ft cap, Port.
1—LINK-BELT 48" x 8' Paddle Type.
1—PEKAY No. 160-1-24 Mixer Muller, single stage for 24" belt, 230 TPH.
1—SIMPSON No. 1H Style UD—500#.
1—SIMPSON #0, style C, 175 lb.
2—SIMPSON #2, Style C, 1500# w/loader.
3—SIMPSON #3, Style C, 3000 lb.
3—SIMPSON #3, Style UD, 3000 lb.
2—Mixer Muller, 6 cu ft paddle type.
1—LANCASTER No. EDG-4, 5 cu. ft.
1—LANCASTER #EA-4, 6 cu. ft. w/loader.
1—FEDERAL 4 cu ft "Whirl-Mix" Muller.

SAND PREPARATORS

2—NATIONAL #3 Style C Aerators.
6—B & P Screenerators, Models S, M & L.
8—ROYER Models, NC-4, NDS, NDP, NRS.
6—AMERICAN Sand Cutters, Model M, Sizes 79/60, 89/70, 99/80. All late.
4—AMERICAN Model AA and AM, 45" & 60" Cutting Blade.
1—AMERICAN "Sand Master," 102"/70" Cutting Blade—1952.
2—MOULDERS' FRIEND 50" & 60" Brush.
1—SIMPLICITY LP 2' x 3' screen.

SANDSLINGERS

1—B & P Motive Jr., 300 cu ft tank.
2—B & P Tractor Type 19" head & 16" head, 13' arms, Magnetic towers.
6—B & P Models DB Stationary Sand Slingers, 16", 19" and 22" heads, with 20, 25, 40 and 50 HP motors. All late.
2—B & P Swing Type Slingers 19" head.
4—B & P 8 ton plate feeders.
2—B & P 35 ton capacity plate feeders.
6—B & P Tanks for speed slingers.

SHAKEOUTS & SCREENS

1—ALLIS-CHALMERS 5' x 8', portable.
2—LINK-BELT 5' x 10', 6 ton cap.
3—SIMPLICITY 4' x 6', Model B.
1—SIMPLICITY 4' x 8' Model D.
1—SIMPLICITY 4' x 10' Model D.
1—SIMPLICITY 5' x 8', Model D.
1—NATIONAL ENG. 5' x 8' Hex Screen.
1—HEWITT-ROBINS 36" x 78" Vibrex.
1—SIMPLICITY 4' x 10' Model B. Single deck sifter screen, 10 HP motors.
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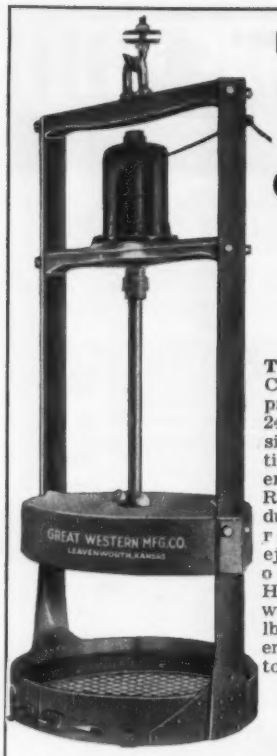

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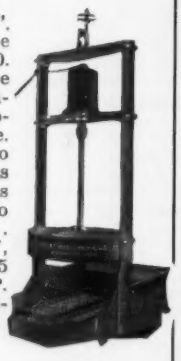

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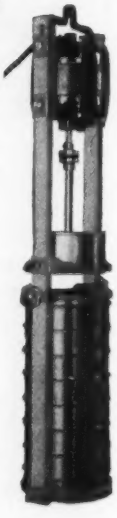

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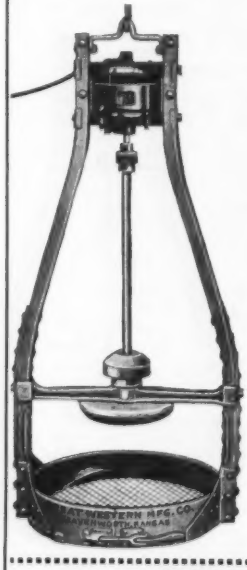

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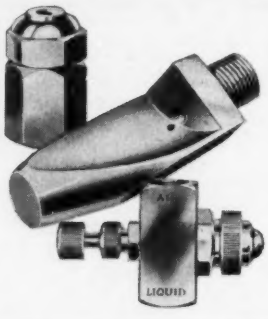

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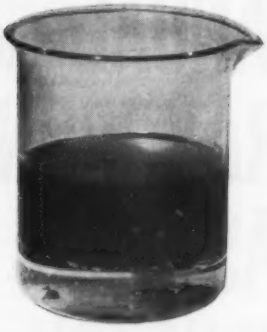

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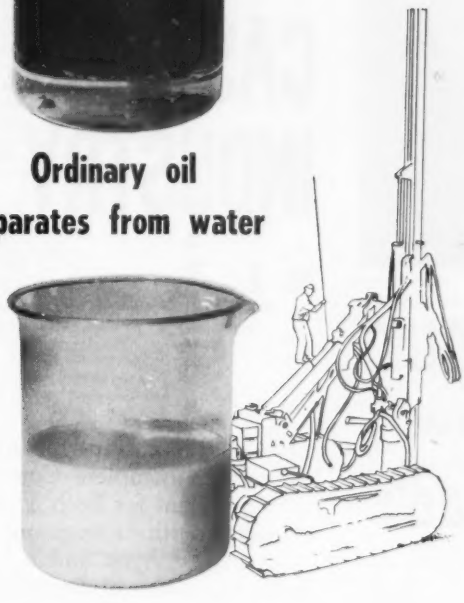

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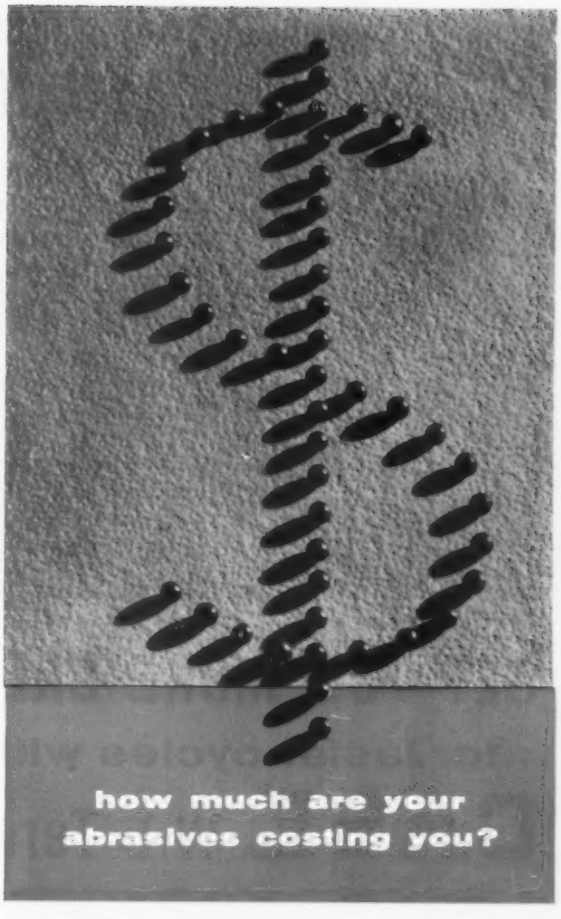

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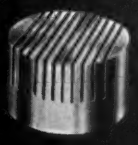

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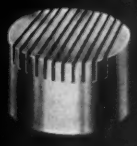

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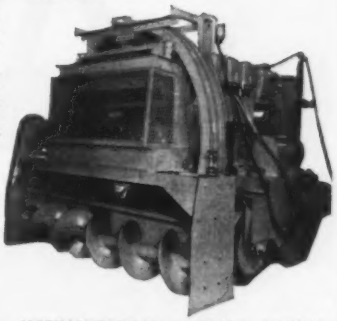

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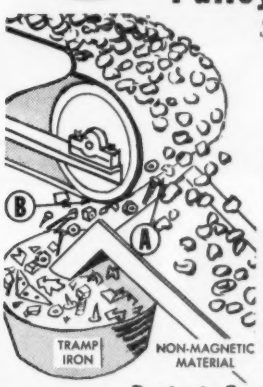
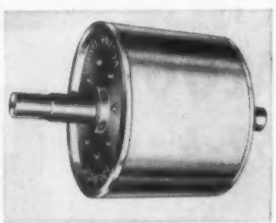




Protects Costly Equipment

- NON-ELECTRIC
- WEATHERPROOF
- NO MAINTENANCE
- EASY TO INSTALL

ALNICO V permanent magnetic castings generate powerful, magnetic forces evenly around pulley. Magnetic field penetrates non-magnetic conveyor belt, holds ferrous metal pieces separate from other materials. Non-magnetic materials fall off at point of gravity (A). As belt leaves pulley, trapped ferrous metal pieces are pulled out of magnetic field, pass below pulley and fall into discard (B). Available in standard pulley sizes; special sizes to order.

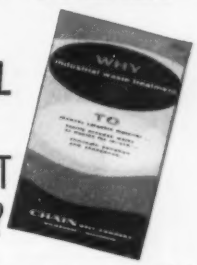
Write for details and prices

AMACO® **American Magnetics Co.**

P. O. Box 254 MOLINE, ILLINOIS

Circle 721 on Page 53

NEED HELP with an INDUSTRIAL WASTE TREATMENT PROBLEM?



If you need help to solve an industrial waste treatment problem, here are two quick steps to the right solution! *First,* send today for your copy of informative Bulletin No. 5578, which gives you a quick picture of what CHAIN Belt Waste Treatment Equipment and processes can do to solve your problem. *Second,* ask for a Rex Man to review your problem and help you select the equipment which will provide effective treatment of your industrial waste. For action, just mail the coupon!

CHAIN BELT

CHAIN Belt Company 700
4692 W. Greenfield Ave., Milwaukee 1, Wis.

☐ Send me Bulletin No. 5578.
☐ Have a Rex Man call.

Name.....
Company.....
Address.....
City.....*Zone*.....*State*.....

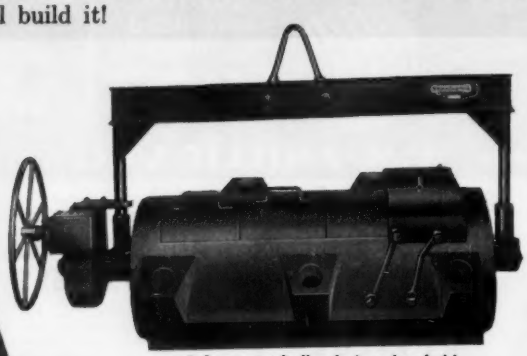
Circle 722 on Page 53

LADLES UNLIMITED

800 pound, straight-sided ladle with square bail and gearing. Seven standard gear sizes are available for ladles to serve the expanding range of tilting needs.

Wherever metal is treated, inoculated, distributed or poured — MECHANICALLY — the chances are good that the ladle equipment is MODERN! Ladles in all types and sizes are engineered to the metal loads and pouring conditions. There are no size limitations: You name it! We'll build it!

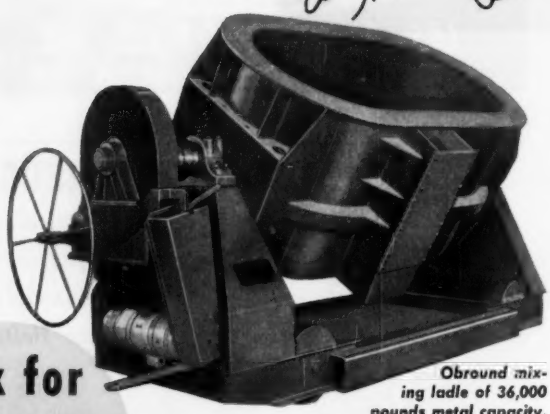
Modern 17½" top diameter, tapered, covered ladle with No. 1 type shank, roller bearing trunnions and detachable bail.



A five-spout ladle, designed to hold 1500 pounds, pours from either side.

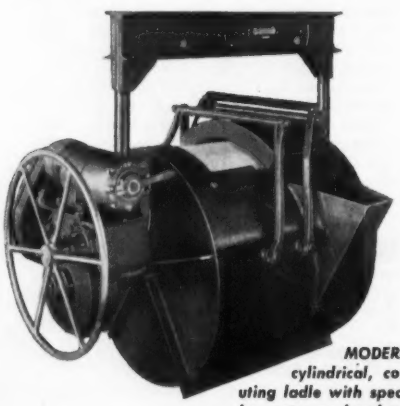
Pete-
I believe we should order a couple new ladles now! See me!
B.K.

82" diameter ladle having 50,000 pounds metal capacity and built to steel mill specifications.



Obround mixing ladle of 36,000 pounds metal capacity.

Ask for CATALOG P-152-A



MODERN 2000 pound cylindrical, covered, distributing ladle with special bail. Tilted by motor or hand wheel.

Special inoculation ladle on transfer car. Ladle bowl is detachable.

MODERN **MODERN EQUIPMENT COMPANY**

PORT WASHINGTON, WISCONSIN

Circle 723 on Page 53

Nothing yet tried has been able to fuse Stevens Plumbago! Not even the hottest blowtorch.

GET YOUR FREE SAMPLE OF NEW STEVENS BLACK VELVET PLUMBAGO!

For more than 50 years, Stevens Plumbago has been the foundryman's favorite. Now there's a brand-new Stevens Plumbago on the market. It promises to be an even greater favorite . . . because it's made of finer materials than ever before – the finest in the world.

- Use it dry as a mold coating.
- Mix it with molasses water and use as a mold wash.
- Add it to core washes to increase heat resistance.
- Use it as an additive to sand to give a heat resistant coating to each grain.

Whichever way you use it, you can be sure that new Stevens Black Velvet Plumbago will definitely improve the quality of your castings.

Write on your letterhead for a free sample. Or ask your local Stevens representative.

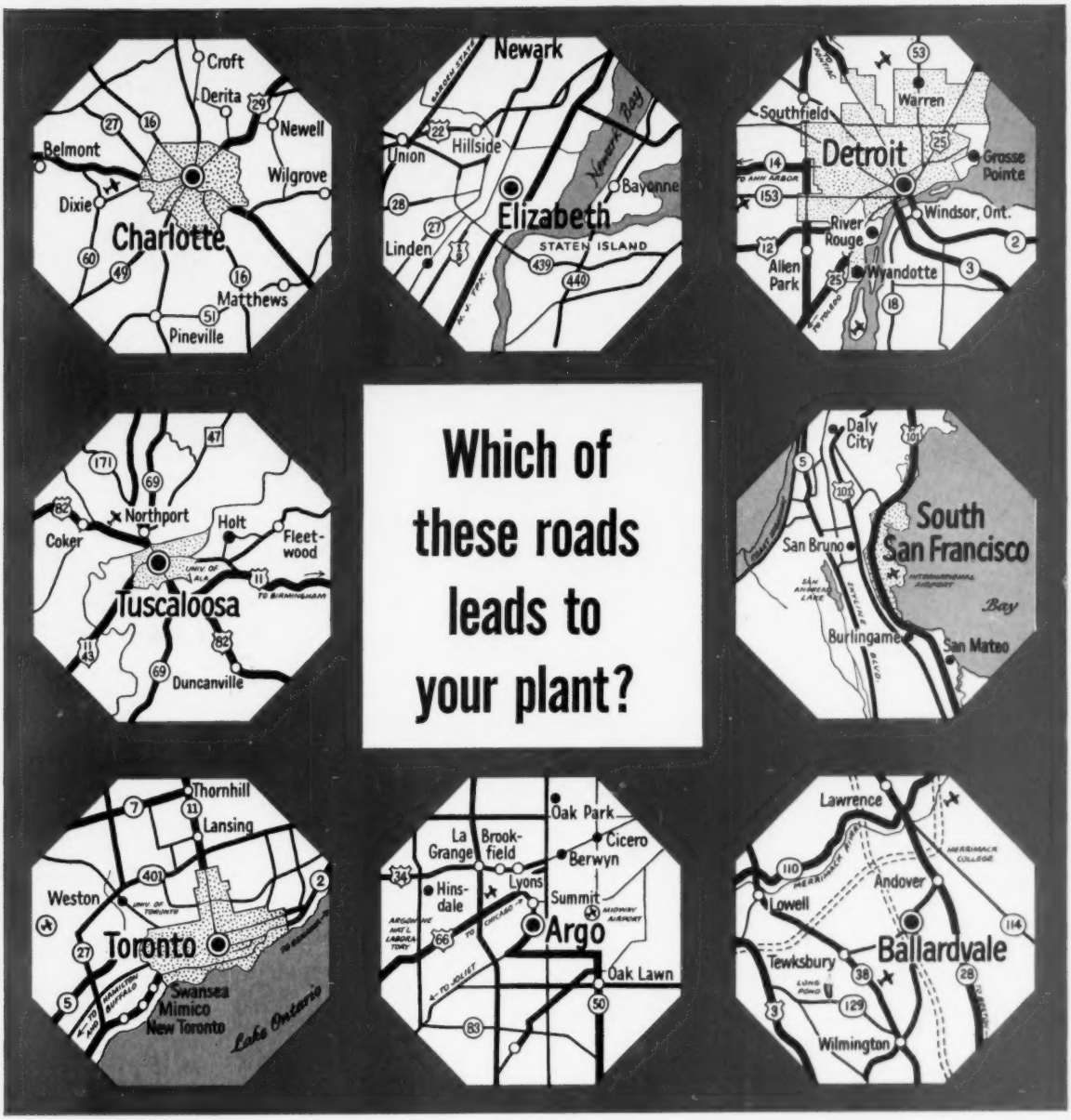
frederic b. **STEVENS, inc.**

DETROIT 16, MICH.

Circle 552 on Page 53

BUFFALO CHICAGO DETROIT CLEVELAND
INDIANAPOLIS MILWAUKEE NEW HAVEN SPRINGFIELD (OHIO)

EVERYTHING FOR A FOUNDRY



Get fast delivery of quality foundry binders from RCI

Is fast, dependable delivery of quality foundry binders important to your production? Reichhold now ships from eight strategically located plants and/or bulk storage points – more than any other producer. The plants are located at: Charlotte, N. C.; Elizabeth, N. J.; Detroit, Mich.; Tuscaloosa, Ala.; So. San Francisco, Calif.; Ballardvale, Mass.; Toronto, Ont. (Reichhold Chemicals, [Canada] Ltd.); bulk storage facilities at: Argo, Ill.

Equally important, Reichhold's experience in the foundry resin field is an assurance that RCI phenolics and amino-aldehydes can satisfy any of your core sand mixture requirements.

Why not contact your Reichhold representative for more information on RCI foundry products.

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Creative Chemistry... Your Partner in Progress

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FOUNDRY PRODUCTS

FOUNDREZ—Synthetic Resin Binders
coRCIment—Core Oils
COROVIT—Self-curing Binders

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